IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

TO:	ATTY. DKT. NO.
Assistant Commissioner for Patents Washington, D.C. 20231	3757.3003

PATENT APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of:

INVENTOR(S): ODDSEN, ODD N., JR.

TITLE: ARM APPARATUS FOR MOUNTING ELECTRONIC DEVICES

Enclosed are the following papers required for a filing date under 35 CFR §1.53(b):

- ☒ Specification 32 pages
- ☒ Claims 38 pages
- ☒ Abstract 1 pages
- ☒ Drawings 8 sheets ☐ formal ☒ informal

The following additional papers are enclosed:

- ☐ Fee Transmittal
- ☒ Declaration and Power of Attorney
- ☒ Verified Statement(s) of Small Entity Status ☐ Independent Inventor ☒ Small Business ☐ Non-Profit ☐ Other
- ☐ Information Disclosure Statement ☐ Form PTO-1449
- ☐ Assignment and Cover Sheet
- ☐ Other:

Dated: 9/24/99

Signature

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLN NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTY. DKT. NO.
UNKNOWN	UNKNOWN	ODDSEN, JR., ODD N.	3757.3003
TITLE: ARM APPARATUS FOR MOUNTING ELECTRONIC DEVICES		ART UNIT: UNKNOWN	EXAMINER: UNKNOWN

Assistant Commissioner for Patents
Washington, D.C. 20231

CERTIFICATE OF MAILING (37 CFR 1.10)

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I hereby certify that the following *attached* paper or fee:

Patent Application; including Specification (32pp.), Claims (38pp.), Drawings (8pp.), and Abstract (1p.).

is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to Assistant Commissioner for Patents, Washington, D.C. 20231.

Laura J. Kelly

Laura J. Kelly

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLN / PATENT NO.	FILING / ISSUE DATE	APPLICANT / PATENTEE	
UNKNOWN	UNKNOWN	ODDSEN	
TITLE			ATTY. DKT. NO.
ARM APPARATUS FOR MOUNTING ELECTRONIC DEVICES			3757.3003

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9 and 1.27)--SMALL BUSINESS CONCERN

I hereby declare that I am

☐ the owner of the small business concern identified below:

☒ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF SMALL BUSINESS CONCERN: INNOVATIVE OFFICE PRODUCTS, INC.

ADDRESS OF SMALL BUSINESS CONCERN: 2100 LIBERTY STREET, EASTON, PA 18042

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.12, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

☒ the specification filed herewith.

☐ application serial no. , filed .

☐ patent no. , issued .

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

☒ no such person, concern or organization. ☐ persons, concerns or organizations listed below.

NAME: ADDRESS:

☐ individual ☐ small business concern ☐ nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in the loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small business entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME: ODD N. ODDSEN, JR. TITLE: VICE PRESIDENT

ADDRESS: 2100 LIBERTY STREET, EASTON, PA 18042

SIGNATURE: ______________ DATE: Sept 24 1999

ARM APPARATUS FOR MOUNTING ELECTRONIC DEVICES

This application claims priority under 35 U.S.C. §119(e) for provisional application number 60/133,378 filed on May 10, 1999.

Field Of The Invention

This invention relates to an arm apparatus for mounting electronic devices and a method for manufacturing the arm apparatus, and more specifically to an extension arm suitable to mount a flat-screened electronic peripheral device, such as a computer monitor or television and the method for manufacturing the extension arm.

Background Of The Invention

Adjustable extension arms for mounting electronic peripheral devices, such as a computer monitor or a television, are well known in the prior art. However, due to recent advances in flat-screen technology, there is a demand for adjustable extension arms that are particularly suited for use with flat-screen devices, such as flat screen computer monitors and televisions.

Figures 1-7 are assembly drawings of an extension arm 10 for mounting a peripheral device, in accordance with the prior art. As shown in Figure 1, the main elements of the extension arm 10 are a first end cap 12, an upper channel 14, a lower channel 16,

a second end cap 18, and a forearm extension 20. The first end cap 12 has an end cap shaft 22 that is pivotably attachable to a rigid support mount (not shown), such as an orifice sized to accept the end cap shaft 22 or a track configured and sized to engage the grooves on end cap shaft 22. The first end cap 12 is pivotably coupled via pins 24 to both the upper channel 14 and the lower channel 16. The opposite ends of the upper channel 14 and the lower channel 16 are pivotably coupled via pins 24 to the second end cap 18. The second end cap 18 is coupled to the forearm extension 20 via a forearm extension pin 92. The forearm extension 20 has a vertically disposed hole 26 therethrough for accepting a device mount (not shown) such as a tilter, platform or other apparatus. The combination of the upper and the lower channels 14, 16 and the first and the second end caps 12, 18 form an adjustable parallelogram that permits a device coupled to the forearm extension 20 to be raised and lowered to a desirable height. The parallelogram retains its position by employing a gas spring 28, which is pivotably and adjustably attached to the first end cap 12 and the upper channel 14, as will be further described below. Generally, the gas spring 28 is sized so as to have a fixed length until an upward or downward force is exerted at the second end cap 18 that exceeds the gas spring's designed resistance. Thus, the gas spring 28 causes the parallelogram to retain its position when the only force exerted at the second end

cap 18 is the weight of the device, but permits the parallelogram to be adjusted when a user pushes the device coupled to the forearm extension 20 up or down.

Figure 2 illustrates a side view of the first end cap 12, having the end cap shaft 22 disposed on a first end 30 of the first end cap 12. To provide a rigid connection between the two pieces, the end cap shaft 22 is typically machined from steel and is inserted into the first end 30 during the casting process of the first end cap 12. The end cap shaft 22 has a hole 32 formed in an end of the end cap shaft 22 that is inserted into the first end cap 12. The first end cap 12 is typically fabricated from cast aluminum. The first end cap 12 also has a second end 34 having a hole 36 disposed therethrough. Disposed within the first end cap 12 is a threaded rod 38. A first end 40 of the threaded rod 38 is inserted into the hole 32 at the base of the end cap shaft 22. A second end 42 of the threaded rod 38 is aligned with the hole 36 and is held in place by a clip 44. The clip 44 is fastened to an inner surface of the first end cap 12 by screws 46.

Threadedly mounted on the threaded rod 38 is a clevis 48. Figure 3 illustrates a sideview of the clevis 48 including a tapped hole 50 in the center thereof. The tapped hole 50 receives the threaded rod 38, as shown in Figure 2. At a first end of the clevis 48 is a pair of fastening members 52, 54 to

which are fastened one end of the gas spring 28. A second end 56 of the clevis 48 is configured to slidably engage a track 58 which is integrally molded in the first end cap 12 (see Figure 2). The second end 42 of the threaded rod 38 is configured to be engaged by a hex-shaped key which is inserted through the hole 36 when the second end 42 is properly aligned with the hole 36. The hex-shaped key is employed so as to rotate the threaded rod 38 along its axis of rotation. When the threaded rod 38 is rotated along its axis of rotation, the clevis 48 moves along the length of the threaded rod 38 in a direction that corresponds to the direction which the hex-shaped key is turned. This movement of the clevis 48 permits the gas spring 28 to be adjusted.

Figures 4(a) and 4(b) illustrate the upper channel 14, which comprises channel bottom 60 from which extend two channel sidewalls 62. Channel bottom 60 and sidewalls 62 are typically stamped from 13 gauge steel sheet in order to give the upper channel 14 a desired degree of structural rigidity. At each of the ends of the channel bottom 60, a semi-circular region 64 of the sidewalls 62 is cut out to accommodate cold-rolled steel rollers 66, which have a hole 68 therethrough for receiving the pins 24. The rollers 66 are rigidly attached to the upper channel 14 by MIG welding along the edge of the semi-circular cut out region 64 and along the ends of the channel bottom 60.

Additionally, the upper channel 14 comprises stiffener 70,

which is welded to an inner surface of the channel bottom 60. Besides providing additional structural rigidity to the upper channel 14, the stiffener 70 has a hole disposed at one end with a threaded ball stud 72 placed within the hole and fixed in place by a nut 74. The ball stud 72 is configured and sized to receive one end of the gas spring 28. The longitudinal centerline 76 of the upper channel 14 is illustrated in Fig. 4(b).

Figures 5(a) and 5(b) illustrate the lower channel 16 which comprises a channel bottom 78 from which extend two channel sidewalls 80. As with the upper channel 14, the channel bottom 78 and sidewalls 80 are typically stamped from 13 gauge steel sheet, which is relatively heavy in order to give the lower channel 16 a desired degree of structural rigidity. At opposite ends of the channel bottom 78, a semi-circular region 82 of the sidewalls 80 is cut out to accommodate cold-rolled steel rollers 84, which have a hole 86 therethrough for receiving the pins 24. The rollers 84 are rigidly attached to the lower channel 16 by MIG welding along the edge of the semi-circular cut out region 82 and along the ends of the channel bottom 78. The longitudinal centerline 88 of the lower channel 16 is illustrated on Fig. 5(b).

Figure 6 illustrates the second end cap 18. Unlike the first end cap 12, the second end cap 18 does not have an end cap shaft, nor does it have a clevis assembly for attachment to the

gas spring 28. Instead, the second end cap 18 has a hole 90 disposed in a bottom end for receiving the forearm extension pin 92, and a hole 94 in a side for inserting a pin 96 into the forearm extension pin 92, as illustrated in Figure 1.

Figure 7 illustrates the forearm extension 20 having the forearm extension pin 92 welded thereto. The forearm extension pin 92 has a hole 98 formed in an upper end to receive the pin 96. The forearm extension 20 is configured to be pivoted around the forearm extension pin 92, and is held in place within the second end cap 18 by the pin 96 which penetrates the hole 94 of the second end cap 18 and the hole 98 of the forearm extension pin 92.

Extension arms 10 of the prior art, such as the one shown in Figures 1-7 and others like it, are ill-suited for flat-screen monitors and televisions, in that they are bulky and cumbersome. In addition, due to the configuration of its various parts, extension arms 10 of the prior art cannot be flattened against a mounting surface so that the entire extension arm 10 is hidden behind the flat screen device when the device is substantially flush with the mounting surface. Additionally, the extension arms 10 of the prior art are costly to manufacture and difficult to assemble.

Thus, there is a need for an extension arm suitable to mount a flat-screened electronic peripheral device, such as a computer

monitor or television, that is inexpensive and easy to manufacture and assemble, and that permits a flat-screen device to be mounted substantially flush with the mounting surface.

Summary Of The Invention

The present invention, in accordance with one embodiment, relates to an extension arm suitable for mounting a flat-screened electronic peripheral device, such as a computer monitor or television. The extension arm is inexpensive and easy to manufacture and assemble, and permits a flat-screen device to be mounted substantially flush with a mounting surface.

According to one embodiment, the extension arm comprises a forearm extension that has at one end a first coupling for attachment to a tilter, a platform or other means for supporting a flat-screen device. At the other end of the forearm extension is a second coupling. The extension arm also comprises a pair of end caps each having an end cap shaft. The end cap shaft of the first end cap is pivotably rotatable in a support mount, such as a wall, desk or pole mount. The end cap shaft of the second end cap is pivotable rotatable in the second coupling of the forearm extension.

The extension arm also comprises an upper channel and a lower channel. The upper channel has at opposite ends a pair of integrally cast rollers. Each roller is pivotably attached to

each of the end caps. The lower channel also has at opposite ends a pair of integrally cast rollers, which are pivotably attached to each end cap. The upper and lower channels and the end caps form an adjustable parallelogram. The shape of the parallelogram is retained by a gas spring. One end of the gas spring is attached to a ball stud mounted in the upper channel. The other end of the gas spring is adjustably mounted to the first end cap.

The extension arm also comprises a clevis, which is located within the first end cap. The clevis is pivotably attached to the end of the gas spring which is mounted in the first end cap. A threaded rod threadedly engages the clevis, such that the clevis slides within the first end cap when the rod rotates around its axial centerline. The threaded rod is rotatably secured within the first end cap by a retainer clip and a pair of screws.

Brief Description Of The Drawings

The subject matter regarded as the invention is particularly pointed out and distinctly claimed in the concluding portion of the specification. The invention, however, both as to organization and method of operation, together with features, objects, and advantages thereof may best be understood by reference to the following detailed description when read with

the accompanying drawings in which:

Figure 1 is an assembly drawing of an extension arm for mounting a computer monitor, in accordance with the prior art;

Figure 2 illustrates a first end cap of an extension arm, in accordance with the prior art;

Figure 3 illustrates the clevis assembly of an extension arm, in accordance with the prior art;

Figures 4(a) and 4(b) illustrate the upper channel of an extension arm, in accordance with the prior art;

Figures 5(a) and 5(b) illustrate the lower channel of an extension arm, in accordance with the prior art;

Figure 6 illustrates a second end cap of an extension arm, in accordance with the prior art;

Figure 7 illustrates a forearm extension of an extension arm, in accordance with the prior art;

Figure 8 is an exploded assembly drawing of an extension arm for adjustably mounting a flat-screen device to a support mount, according to one embodiment of the invention;

Figures 9(a)-(d) show several views of end caps, in accordance with one embodiment of the invention;

Figures 10 (a)-(d) illustrate several views of an upper channel, according to one embodiment of the invention;

Figures 11(a)-(e) illustrate several views of a lower channel, according to one embodiment of the invention;

Figures 12(a) and 12(b) illustrate a forearm extension, in accordance with one embodiment of the invention; and

Figures 13(a) and 13(b) illustrate a forearm extension, in accordance with one embodiment of the invention.

Detailed Description Of The Invention

The present invention, in accordance with one embodiment, relates to an extension arm suitable for mounting a flat-screen electronic peripheral device, such as a computer monitor or television, and the method of manufacturing the extension arm. Figure 8 is an exploded assembly drawing of the extension arm, for adjustably mounting a device to a support mount, according to one embodiment of the invention.

In the embodiment shown, the extension arm 100 comprises a first end cap 102, an upper channel 104, a lower channel 106, a second end cap 108, and a forearm extension 110. The first end cap 102 and the second end cap 108 both include a partially enclosed housing 112 and a shaft 114. The partially enclosed housing 112 of both the first and the second end caps 102, 108 is configured with, for example, holes 116 to receive a connection mechanism, such as a pin 118, therethrough. The shaft 114 of the first end cap 102 is configured to be inserted for pivotable rotation in a support mount (not shown), which may be a wall, a desk, a pole mount, or a configurable mount as shown and

described in Applicant's co-pending patent applications: application number 60/106,729 filed on November 2, 1998 and application number 60/108,469 filed on November 14, 1998. The shaft 114 of the second end cap 108 is configured to be inserted for pivotable rotation in the forearm extension 110.

The partially enclosed housing 112 of the first end cap 102 also includes a clevis 120, which is pivotably attached to an end of a gas spring 122, mounted therein. A threaded rod 124 is in threaded engagement with the clevis 120, such that the clevis 120 is configured to slide within the first end cap 102 when the threaded rod 124 rotates on its axis. The threaded rod 124 is rotatably secured in the first end cap 102 by a retainer clip 126 that is attached to the first end cap 102 with, for example, screws 128.

The upper channel 104 includes a U-shaped body 130 and integrally cast rollers 132 disposed at opposite ends of the U-shaped body 130. Each of the rollers 132 is configured to be pivotably attached to a respective one of the first end cap 102 and the second end cap 108 with, for example, the pins 118. The lower channel 106 also includes a U-shaped body 134 and integrally cast rollers 136 disposed at opposite ends of the U-shaped body 134. Each of the rollers 136 is configured to be pivotably attached to a respective one of the first end cap 102 and the second end cap 108 with, for example, the pins 118.

The upper and the lower channels 104, 106 and the first and the second end caps 102, 108 are configured so as to form an adjustable parallelogram. When configured, the shaft 114 of the first endcap 102 and the shaft 114 of the second end cap 108 point in opposite directions. For example, the shaft 114 of the first end cap 102 extends vertically downward while the shaft 114 of the second end cap 108 extends vertically upward. The shape of the parallelogram is retained by the gas spring 122. One end of the gas spring 122 is attached to a ball stud 138 which is mounted to the upper channel 104. The other end of the gas spring 122 is adjustably mounted to the clevis 120 within the first end cap 102. Generally, the gas spring 122 is sized so as to have a fixed length until an upward or downward force is exerted at the second end cap 108 that exceeds the gas spring's designed resistance. Thus, the gas spring 122 retains the parallelogram shape when the only force exerted at the second end cap 108 is the weight of the flat-screen device. However, the gas spring 122 permits the parallelogram shape to be adjusted when a user pushes the flat-screen device coupled to the forearm extension 110 up or down.

The forearm extension 110 includes a body 140 having a first female coupling 142 located on a first end and a second female coupling 144 located on a second end. The first female coupling 142 is for attachment to the shaft 114 of the second end cap 108.

The second female coupling 144 is for attachment to a device mounting (not shown) such as a tilter, as described in Applicant's co-pending patent application number 60/137,088 filed on June 2, 1999; a platform or other means for supporting a flat-screen device.

Additional advantages and features of the individual components, according to various embodiments of the present invention, are further described below.

End Caps 102, 108

Figure 9(a) illustrates a side view, and Fig. 9(b) illustrates a top view of the first end cap 102 and the second end cap 108, in accordance with one embodiment of the invention. In the embodiment shown, each of the first and second end caps 102, 108 includes the partially-enclosed housing 112 which has flat, oppositely-disposed endwalls 146 and 148 fixedly connected by a sidewall 150. The sidewall 150 extends partially around the partially-enclosed housing 112 so as to permit manipulation of components to be assembled within the first and second end caps 102, 108. In one embodiment, the endwalls 146 and 148 are semi-circular in shape and are connected along a semi-circular edge to the sidewall 150, which extends perpendicularly therebetween.

Figure 9(a) is a side view (from the perspective of the open region of the sidewall 150), that illustrates the first and the

second end caps 102, 108 having the shaft 114 disposed on the endwall 148. The shaft 114 is preferably integrally molded to the endwall 148 of each of the end caps 102, 108. Preferably the entire end caps 102, 108 (partially enclosed housings 112 and shafts 114) are molded from zinc. The endwall 146 has a hole 152 disposed therethrough. Within the partially enclosed housing 112 and integrally molded on the sidewall 150 adjacent the endwalls 146, 148 are stops 156. The stops 156 serve to stop upward or downward movement of the extension arm 100 when ends of the lower channel 106 and the upper channel 104, respectively, meet the stops 156 when the extension arm 100 is in extended positions.

Also within the partially-enclosed housing 112, and integrally molded to the inner surface of the sidewall 150 are trough walls 158 which run longitudinally along the inner surface of the sidewall 150 between the endwalls 146 and 148 so as to define a trough 160 therebetween. Figure 9(b) illustrates a side view of the trough 160 disposed between the trough walls 158.

Additionally within the partially enclosed housing 112 and integrally molded with the inner surface of the sidewall 150, and proximate the endwall 148, are shelves 162. Figure 9(b) illustrates a side view of the shelves 162 which define co-planar faces separated by a groove 164. The shelves 162 have a connection means, such as self-tapping screw holes 154 disposed therein. The co-planar faces of the shelves 162 are configured

to engage the retainer clip 126, which is fastened in place by, for example, the pair of screws 128. When the retainer clip 126 is fastened in place, the groove 164 defines a spacing for accepting one end of the threaded rod 124, as discussed below.

The first end cap 102 and the second end cap 108 are identical at this point. However, while the manufacturing of the second end cap 108 is complete, the first end cap 102 still requires assembly of the threaded rod 124 and the clevis 120. The threaded rod 124 is employed within the first end cap 102 so as to adjustably support the clevis 120. Figure 9(c) illustrates the threaded rod 124 in greater detail. A first end 166 has a circular cross-section within which is axially disposed a shaped opening 168, for example a hex-shaped opening, for accepting a shaped key (not shown), such as a hex-shaped key. Advantageously, a cross-sectional diameter of the first end 166 is smaller than a cross-sectional diameter of the hole 152, so as to be inserted therein. Adjacent the first end 166 is a shoulder 170. Advantageously, the shoulder 170 has a circular cross-section having a diameter that is larger than the cross-sectional diameter of the hole 152. Thus, in the preferred embodiment, the shoulder 170 abuts an inner surface of the endwall 146 and retains the first end 166 within the hole 152.

The threaded rod 124 also includes a threaded section 172 which is configured to threadingly engage the clevis 120. The

second end 174 of the threaded rod 124 is disposed in the groove 164 located between the shelves 162 of the first end cap 102. Preferably, the second end 174 of the threaded rod 124 has a circular cross-section having a diameter that is smaller than the size of the groove 164, such that the second end 174 is supported between the shelves 162 but is free to rotate therein.

As previously mentioned, threadedly mounted on the threaded rod 124 is the clevis 120. The clevis 120 as illustrated in Figure 9(d), has a tapped hole 176 formed therein for receiving the threaded rod 124. The clevis 120 also has a fastening member 178 at a first end, which is fastened to one end of the gas spring 122. The second end of the clevis 120 is configured to slidably engage the trough 160.

When the first end 166 of the threaded rod 124 is engaged by the shaped key, the shaped key is employed so as to rotate the threaded rod 124 around its axial centerline. When the threaded rod 124 is rotated around this axis of rotation, the clevis 120 moves along the length of the threaded rod 124 in a direction that corresponds to the direction which the hex-shaped key is turned. This movement of the clevis 120 permits the gas spring 122 to be adjusted.

The end caps 102, 108 have numerous manufacturing advantages over the end caps 12, 18 of the prior art, and others like it. Unlike the prior art end caps 12, 18 which are different from

each other, the end caps 102, 108 are advantageously manufactured the same way. The threaded rod assembly 124 and the clevis 120 of the first end cap 102 are subsequently assembled in the first end cap 102. Thus, the cost of manufacturing two different kinds of end caps are eliminated.

Moreover, the cost of manufacturing each end cap 102, 108 is reduced significantly. In the prior art, a significant part of the cost of the first end cap 12 is the steel shaft 22, which is machined separately, and then is inserted into the aluminum cast mold. By contrast, the shaft 114 is integrally molded with the end caps 102, 108 by employing interlocking mold technology. Interlocking molds permit a near-perfect mold to be made, minimizing the machining that is required to insure that the shaft 114 is not out-of-round. By minimizing the amount of machining that is required to be performed on the shaft 114, the use of interlocking molds insures that the strength of the casting, which is primarily located in the skin of the cast, is maximized.

As previously mentioned, all the components of the endcaps 102, 108 are preferably cast molded from zinc, though the present invention is not limited in scope in this respect. Using zinc for the partially enclosed housings 112 is an improvement over the aluminum end caps 12, 18 employed in the prior art. That is, the zinc is stronger and more flexible than the aluminum.

The first end cap 102 also has numerous assembly advantages over the first end cap 12 of the prior art, and others like it. For instance, the assembly time required to rotatably fasten the threaded rod 124 in the first end cap 102 is greatly reduced. In order to assemble the threaded rod 124 of the present invention, the first end 166 is inserted into the hole 152 until the shoulder 168 abuts the inner surface of the endwall 146. The second end 174 of the threaded rod 124 is then positioned in the groove 164 between the shelves 162. The second end 174 is held in place by the retainer clip 126 which is fastened in place by, for example, the screws 128, which are easily accessible due to their proximity above the threaded rod 124. The first end 166 of the threaded rod 124 is perfectly aligned with the hole 152, and will remain so, because it is inserted for rotation therein.

By contrast, the assembly of the threaded rod 38 in the first end cap 12 of the prior art is more complicated, and therefore, more costly. For example, the first end 40 is inserted into the hole 32 in the base of the end cap shaft 22. Next, the clevis 48 is mounted on the rod 38, and then the second end 42 is fastened inside the first end cap 12 by the clip 44. The clip 44 is also employed to align the second end 42 relative to the hole 36. Thus, the clip 44 must be fastened inside the first end cap 12 with precision, so as to insure that the second end 42 is aligned relative to the hole 36 such that the second

end 42 can be engaged by a hex-shaped key which is inserted into the hole 36. Moreover, the screws 46 which are employed to the fasten clip 44 inside the first end cap 12 are difficult to access due to their position underneath the rod 38, thus complicating the process of aligning the second end 42 with the hole 36. In addition, the fastening of the clip 44 inside the first end cap 12 is also rendered more difficult because the clevis 48 is already attached to the gas spring 28.

Unlike the prior art, the current invention does not require a forearm extension pin 92 to connect the second end cap 18 to the forearm extension 20. Moreover, the pin 96 is not required to hold the forearm extension pin 92 within the second end cap 18. Instead, the current invention uses the shaft 114 of the second end cap 108 to connect the second end cap 108 to the forearm extension 110. Thus, manufacturing costs can be reduced since there in no need to manufacture the forearm extension pin 92 or the pin 96, and there is no reason to form the hole 94 within the second end cap 18 or the hole 98 within the forearm extension pin 92 to accept the pin 96.

Upper Channel 104

Figures 10a-d illustrate several views of the upper channel 104, according to one embodiment of the invention. The U-shaped body 130 of the upper channel 104 comprises a channel bottom 180

from which extend two channel sidewalls 182. Unlike the upper channel 14 of the prior art extension arm shown in Figures 4a-b, which is stamped from heavy gauge steel, the channel bottom 180 and the sidewalls 182 of the upper channel 104 are preferably integrally cast from zinc, which gives the upper channel 104 a lesser weight, and a degree of structural rigidity, more suitable for lighter-weight flat screen devices. At each end of the channel bottom 180 are the rollers 132, which are also integrally cast. The rollers 132 have a hole 184 therethrough (either cast or subsequently drilled) for receiving a connection mechanism, such as the pins 118. Additionally, the upper channel 104 comprises a threaded hole 186 configured and sized to receive a threaded end of the ball stud 138. The threaded hole 186 is also integrally cast. The ball stud 138 is configured and sized to receive one end of the gas spring 122.

The upper channel 104 has numerous manufacturing advantages over the upper channel 14 of the prior art, and others like it. For instance, with reference to the upper channel 14 of the prior art shown in Figures 4a-b, the welding which is required to attach the rollers 66 to the upper channel 14 is difficult to perform. The axial centerlines of the rollers 66 must be near-perfectly parallel to each other, while being near-perfectly perpendicular to the longitudinal centerline 76 of the channel bottom 60. The tolerances for these angles are very small so as

to insure that the lower channel 16 engages the upper channel 14 when the parallelogram is adjusted. These tolerances are very difficult to meet when the rollers 66 are welded to the upper channel 14. By contrast, the rollers 132 of the upper channel 104 of the present invention are integrally cast so as to insure that the axial centerlines of rollers 132 are simultaneously perfectly parallel to each other and perfectly perpendicular to a longitudinal centerline 188 of the channel bottom 180.

Additionally, with further reference to Figures 4a-b and as previously noted, due to the hardness of the steel employed for the prior art upper channel 14, the rollers 66 must be MIG welded thereto, which in turn requires the rollers 66 to be fabricated from expensive cold-rolled steel. Although it is tempting for a manufacturer of the rollers 66 to employ a cheaper material, such as leadloy, these cheaper materials do not provide a safe and consistent weld when joined to the steel upper channel 14. Typically, tests must be performed on the roller material to insure that leadloy has not been supplied. By contrast, the upper channel 104 of the present invention requires no welding, eliminating the cost of aligning the rollers, the cost of performing the welding and the cost of testing the rollers to determine if they are a suitable welding material.

An additional disadvantage of welding the rollers 66 to the upper channel 14 is that the heat produced by welding the rollers

66 to the upper channel 14 may cause the upper channel 14 to curl or deform. If this occurs, alignment of the rollers 66 is ruined and the upper channel 14 is rendered useless, requiring it to be discarded. By eliminating any welding required during the manufacture of the upper channel 104, the likelihood of heat-deforming the upper channel 104 is also eliminated and materials are not wasted.

As previously mentioned, the prior art upper channel 14 is made of steel, which means that the upper channel 14 is formed by heating a piece of steel and bending the steel to form the channel bottom 60 and the sidewalls 62. Thus, precise manufacturing is required to ensure the sidewalls 62 extend up from the channel bottom 60 at 90 degree angles. If the angle is slightly off it will likely cause the upper channel 14 and the lower channel 16 to scrape against one another. The use of cast molding in the current invention ensures the angle between the channel bottom 180 and the sidewalls 182 is exactly the same each and every time. Thus, the liklihood of scraping is greatly reduced, if not eliminated.

Moreover, as illustrated in Figures 10c and 10d, which are cross-sectional views of the upper channel 104, the sidewalls 182 are tapered. Both an outer surface and an inner surface of the sidewalls 180 tapers in approximately 1 degree. The taper is possible because the upper channel 104 is, in the preferred

embodiment, cast molded. The taper provides several advantages including more clearance between the upper and the lower channels 104, 106 when the upper and the lower channels 104, 106 are brought together during usage. That is, the inner surface of the sidewall 180 being displaced by 1 degree means that there will be additional clearance for the lower channel 106 to fit therewithin. The additional clearance will help prevent the upper channel 104 and the lower channel 106 from scraping together. Thus, damage to the paint or other coating that may cover the upper and the lower channels 104, 106 will be further reduced, if not eliminated. Moreover, less material is needed at outer edges of the sidewalls 182. Furthermore, the taper is more aesthetically pleasing to the eye of the user.

Additionally, the upper channel 104 eliminates the requirement for the stiffener 70, which, with reference to Figures 4a-b, is welded to the inner surface of the channel bottom 60 in the upper channel 14 of the prior art. Unlike the upper channel 14 of the prior art, the upper channel 104 does not require the additional structural rigidity provided by the stiffner 70. By eliminating the stiffener 70, the upper channel 104 of the present invention also saves the steps required to weld the stiffner 70 to the channel bottom 60 which are required by the prior art upper channel 14.

Moreover, additional assembly steps are saved by integrally

casting the threaded hole 186 in the upper channel 104 of the current invention. For instance, the prior art upper channel 14 has the threaded ball stud 72 penetrate a hole disposed in the stiffener 70 and is fixed in place by the nut 74. In order to install the ball stud 72, it is required that the threaded end of ball stud 72 be inserted through the hole in the stiffener 70 and be fixed in place by the nut 74 prior to the stiffener 70 being welded in place. No such assembly is required with the upper channel 104 of the present invention.

An additional problem experienced by prior art upper channels 14 is the need to mask openings, such as the holes 68 in the rollers 66 that receive the pins 28 therethrough, when the upper channel is painted or otherwise coated. Specifically, labor is required in order to insert masking material into the openings and then to remove the masking material after the paint has been applied. By contrast, the openings of the present invention are according to one embodiment, precision-drilled after an application of paint or other coatings, thus eliminating the expense of masking any openings.

Lower Channel 106

Figures 11a-e illustrate several views of the lower channel 106, according to one embodiment of the invention. The U-shaped body 134 of the lower channel 106 comprises a channel bottom 190

from which extend two channel side walls 192. Unlike the lower channel 16 of the prior art extension arm shown in Figures 5a-b, which is stamped from heavy gauge steel, the channel bottom 190 and sidewalls 192 of the lower channel 106 are preferably integrally cast from zinc, which gives the lower channel 106 a lesser weight when compared to heavy gauge steel, and a degree of structural rigidity, more suitable for lighter-weight flat screen devices. At each end of the channel bottom 180 are the rollers 136, which are also integrally cast. The rollers 136 have a hole 194 therethrough (either cast or subsequently drilled) for receiving a connection mechanism, such as the pins 118. The channel bottom 190 additionally includes a cable channel aperture 196 running longitudinally. In the embodiment shown, the cable channel aperture 196 has rounded ends, which improves the rigidity of the lower channel 106. The cable channel aperture 196 is configured to receive a cable cover 198 (illustrated in Fig. 11e). The cable cover 198 is configured to removably fit within the cable channel aperture 196. Thus, cables of the mounted device may be substantially retained within the lower channel 106 so as to hide them from view and protect them from harm. The cable channel aperture 196 and the cable cover 198 enable cables to be accessed when desired, while securing them within the lower channel 106.

The lower channel 106 has numerous manufacturing advantages

over the lower channel 16 of the prior art, and other like it. For instance, as described above with reference to the upper channel 104, the rollers 136 of the lower channel 106 of the present invention are integrally cast so as to insure that the axial centerlines of the rollers 136 are perfectly parallel to each other, and that the axial centerlines of the rollers 136 are perfectly perpendicular to a longitudinal centerline 200 of the channel bottom 190. Thus, the need for precision alignment of the rollers 84 prior to welding to the lower channel 16 is eliminated.

Additionally, and as also described with reference to the upper channel 104, the rollers 136 of the lower channel 106 are integrally cast so no welding is required. Thus, the cost of performing the welding and the cost of testing the rollers to determine if they are a suitable welding material is eliminated. Another advantage of eliminating the need for welding the rollers 136 to the lower channel 106 is reducing the likelihood of heat-deforming the lower channel 106 so that materials are not wasted.

As shown in Figures 11c and 11d, which are cross-sectional views of the lower channel 106, the sidewalls 192 of the lower channel 106 are tapered. An outer surface of the sidewalls 192 is tappered approximately 1/2 degree while an inner surface is tappered approximately 1 degree. The taper is possible because the lower channel 106 is, in the preferred embodiment, cast

molded. As noted above with respect to the upper channel 104, the taper provides more clearance between the upper channel 104 and the lower channel 106 so as to reduce or eliminate the chance of the upper and the lower channels 104, 106 scraping. Moreover, less material is needed at outer edges of the sidewalls 192.

A further advantage, as noted above with respect to the upper channel 104, is that the hole 194 within the rollers 136, according to one embodiment, is precision-drilled after an application of paint or other coatings, thus eliminating the expense of masking any openings.

As illustrated in Fig. 11e, the cable cover 198 includes a top cover 202 with two sidewalls 204 pertruding therefrom. A far end of each sidewall 204 has a catch 206 formed thereon so as to engage with the cable channel aperature 196.

Forearm Extension 110

With reference to Figures 12a, 12b, 13a and 13b, the forearm extension 110 includes a body 140, which is preferably U-shaped so that a cable can be hidden therein, having female couplings 142, 144 disposed at each end. The U-shaped body 140 includes a topwall 207 and two side walls 208. The female coupling 142 has an inner diameter 209 that is sized to rotatably engage the shaft 114 of the second end cap 108. As illustrated in Figure 8, the forearm extension 110 and the shaft 114 are securely fastened to

each other by connecting a screw 211 through a coupling top 213 into a hole 215 (Figure 9a) within the shaft 114.

A bushing 210 (Figure 8) is preferably used to engage the female coupling 142 and the shaft 114. That is, the bushing 210 is placed over the shaft 114 and within the female coupling 142. The bushing 210 is preferably made of a smooth material, such as plastic, in order to reduce friction and prevent metal to metal contact. The female coupling 142 preferably has a set screw 212 formed within a wall 214 of the female coupling 142. The set screw 212 is aligned to press against the bushing 210 at approximately the location of a ridge 216 (see Figure 9a) on the shaft 114 of the second end cap 108. When the set screw 212 is tightened it causes the bushing 210 to flex inward and frictionally engage the shaft 114 and thus prevent the forearm extension 110 from rotating about the shaft 114. Advantageously, the female coupling 142 has a plurality of voids 217 formed in the wall 214, which saves on material costs and permits the forearm extension 110, when cast, to be cooled more quickly. The quicker cooling enables the production quantity to be increased.

The female coupling 144 has an inner diameter 218 that is sized to rotatably engage a shaft of a device mount, such as a tilter, platform or other device used to secure flat-screen devices. A bushing 220 (Figure 8), preferably made of a smooth material such as plastic, is placed over the shaft and within the

female coupling 144. The female coupling 144 preferably has a set screw 222 formed within a wall 224 of the female coupling 144. When the set screw 222 is tightened it causes the bushing 220 to flex inward and frictionally engage the shaft and thus prevent the device mount from rotating around the female coupling 144. Advantageously, the female coupling 144 also has a plurality of voids 226 formed in the wall 224.

Figures 12a and 12b illustrate one embodiment of the forearm extension 110, wherein the center of the female couplings 142, 144 are aligned with a longitudinal centerline 228 of the body 140. As illustrated in Fig. 12b, when the axial centerlines of the female couplings 142, 144 are vertically disposed, the body 140 inclines at an angle, such as a 15 degree angle as specifically illustrated in Fig. 12b. It should be noted however that the incline angle is not limited to 15 degrees, and there may in fact be no incline at all in this embodiment.

Figures 13a and 13b illustrate another embodiment of the forearm extension 110, wherein the center of the female couplings 142, 144 do not align with the axial centerline 228 of the body 140. Rather the body 140 is flush with an upper edge of the female coupling 142, resulting in the center of the female coupling 142 being offset from the center of the female coupling 144. As illustrated in Fig. 13b, when the axial centerlines of the female couplings 142, 144 are vertically disposed, the body

140 is horizontally disposed therebetween. It should be noted however that the body 140 is not limited to be horizontally disposed and may be disposed at an incline in this embodiment.

Extension Arm 100

In addition to improvements in manufacturing and assembly, the present invention also offers a functional interchangeability which is not present in the prior art. For instance, several forearm extensions 110 and/or extension arms 100 can be connected end-to-end to provide additional extension length or additional adjustability.

A dual purpose of flat-screen devices is to minimize the amount of space which they occupy while simultaneously being aesthetically pleasing to the eye. Thus, it is desirable that an extension arm for a flat-screen device be able to be mounted substantially flat to its mounting surface while hiding the extension arm behind it. The present invention permits a flat-screen device which is mounted to a wall to be flattened against the wall while hiding the extension arm 100 within the shadow of the device.

The prior art extension arms 10 did not allow this functionality. Referring to Figure 1, if a wall is defined by the plane of the page, it can be seen that a device inserted into the hole 26 may be substantially flattened against the wall when

the upper and the lower channels 14, 16 and the forearm extension 20 are flush against the wall. A flat-screen computer monitor, which is typically about 15 inches wide, will hide from view the forearm extension 20, but may leave exposed the parallelogram formed by the first end cap 12, the upper channel 14, the lower channel 16 and the second end cap 18. In order to hide the parallelogram, the forearm extension 20 needs to be rotated about the forearm extension pin 92 toward the first end cap 12. However, the upper and the lower channels 14, 16 and the first end cap 12 will prevent the forearm extension 20 from being flush against the wall in this configuration. Thus, it is clear that the prior art extension arms 10 could only provide the ability to mount a device flush to the wall or the ability to mount a device so as to hide the forearm extension 20, but not both.

By contrast, the upper and the lower channels 104, 106 of the present invention do not interfere with the rotation of the forearm extension 110. That is, the forearm extension 110 may be folded into a position which is directly above the upper and the lower channels 104, 106. As a result, the mounted device is flush to the mounting surface and substantially hides the parallelogram, formed by the first and the second end caps 102, 108 and the upper and the lower channels 104, 106, as well as the forearm extension 110 from view. Thus, the aesthetic appeal of the extension arm 100 is increased and the space occupied by the

extension arm 100 and the device is minimized.

While only certain features of the invention have been illustrated and described herein, many modifications, substitutions, changes or equivalents will now occur to those skilled in the art. It is therefore, to be understood that the appended claims are intended to cover all such modifications and changes that fall within the true spirit of the invention.

Claims

What is claimed is:

1. An extension arm for adjustably mounting a device to a support mount, said extension arm comprising:

a forearm extension having a first end for attachment to the device and a second end;

a first end cap including a first end cap body and a first end cap shaft, said first end cap shaft pivotably attached to the support mount;

a second end cap including a second end cap body and a second end cap shaft, said second end cap shaft pivotably attached to the second end of said forearm extension;

an upper channel having a first end, a second end, a first roller disposed on the first end and configured to be pivotably attached to said first end cap, and a second roller disposed on

the second end and configured to be pivotably attached to said second end cap;

a lower channel having a first end, a second end, a third roller disposed on the first end and configured to be pivotably attached to said first end cap, and a fourth roller disposed on the second end and configured to be pivotably attached to said second end cap; and

a gas spring rotatably attached at a first end to said upper channel and adjustably attached at a second end to said first end cap, wherein said gas spring is configured to retain said upper channel, said lower channel, said first end cap and said second end cap in a parallelogram shape when the device is positioned.

2. The extension arm of claim 1, wherein said first end cap and said second end cap are ~~identical~~.

3. The extension arm of claim 1, wherein the second end of said forearm extension is a coupling.

4. The extension arm of claim 1, wherein the first end of said forearm extension is a coupling.

5. The extension arm of claim 1, wherein all of said rollers of said upper channel are integrally cast with said upper

channel so as to be an integral part of said upper channel and all of said rollers of said lower channel are integrally cast with said lower channel so as to be an integral part of said lower channel.

6. The extension arm of claim 1, wherein a first end of said first end cap body is connected to said first end cap shaft and a second end of said first end cap body has a hole therein.

7. The extension arm of claim 1, wherein a first end of said second end cap body is connected to said second end cap shaft and a second end of said second end cap body has a hole therein.

8. The extension arm of claim 6, wherein said first end cap further includes:

a clevis pivotably attached to the second end of said gas spring; and

a rod in threaded engagement with said clevis, wherein said clevis is configured to slide within said first end cap when said rod rotates around its axial centerline.

9. The apparatus according to claim 8, wherein a first end of said rod is inserted through said hole in said first end cap

body.

10. The extension arm of claim 9, wherein the first end of said rod has a shaped opening and is configured to rotate around its axis when a shaped key is inserted in said shaped opening and is turned.

11. The extension arm of claim 9, wherein said rod has a shoulder adjacent to the first end, said shoulder having a diameter larger than a diameter of said hole in said first end cap body so that said shoulder abuts an inner surface of the second end of said first end cap body and retains the first end of said rod in said hole.

12. The extension arm of claim 11, wherein said first end cap further includes a pair of shelves separated by a groove.

13. The extension arm of claim 12, wherein said pair of shelves is disposed in said first end cap body adjacent to the first end.

14. The extension arm of claim 12, wherein each of said pair of shelves includes a self tapping screw hole disposed therein.

15. The extension arm of claim 1, wherein said second end cap further includes a pair of shelves separated by a groove.

16. The extension arm of claim 15, wherein said pair of shelves is disposed in said second end cap body adjacent to the first end.

17. The extension arm of claim 15, wherein each of said pair of shelves includes a self tapping screw hole disposed therein.

18. The extension arm of claim 13, wherein a second end of said rod is rotatably secured within said groove in said first end cap, and is retained in place by a retainer clip fastened to said shelves.

19. The extension arm of claim 18, wherein said retainer clip is fastened to said pair of shelves by screws.

20. The extension arm of claim 1, wherein said upper channel has a threaded hole formed therein.

21. The extension arm of claim 20, wherein the second end

of said gas spring is rotatably mounted to said upper channel via a ball stud threadedly mounted in said threaded hole in said upper channel.

22. The extension arm of claim 20, wherein said threaded hole is integrally cast with said upper channel so as to be an integral part of said upper channel.

23. The extension arm of claim 1, wherein said first end cap and said second end cap are fabricated from a zinc material.

24. The extension arm of claim 1, wherein said first end cap and said second end cap are cast molded.

25. The extension arm of claim 24, wherein said first end cap and said second end cap are made via interlocking molding.

26. The extension arm of claim 1, wherein the device is a flat-screen device.

27. The extension arm of claim 26, wherein the flat-screen device is a television.

28. The extension arm of claim 26, wherein the flat-screen

device is a computer monitor.

29. The extension arm of claim 26, wherein said extension arm is configured so as to be substantially hidden behind the flat-screen device when the flat-screen device is positioned flat against a mounting surface.

30. The extension arm of claim 1, wherein a lower surface of said lower channel has a cable channel aperture formed therein.

31. The extension arm of claim 1, wherein all of said rollers have a hole therein at an axial centerline of said roller, said first end cap has a first pair of holes on an upper edge that align with said hole in said first roller and a second pair of holes on a lower edge that align with said hole in said third roller, and said second end cap has a first pair of hole on an upper edge that align with said hole in said second roller and a second pair of holes on a lower edge that align with said hole in said fourth roller.

32. The extension arm of claim 31, wherein each said end cap is pivotably attached to each said channel by inserting a pin through each said hole in each said end cap into each said

respective hole in each said roller.

33. The extension arm of claim 1, wherein said first end cap body further includes stops located within said first end cap body proximate to a first end and a second end.

34. The extension arm of claim 1, wherein said first end cap body further includes a pair of trough walls within said first end cap body, the pair of trough walls forming a trough therebetween.

35. The extension arm of claim 1, wherein said second end cap body further includes stops located within said second end cap body proximate to a first end and a second end.

36. The extension arm of claim 1, wherein said second end cap body further includes a pair of trough walls within said second end cap body, the pair of trough walls forming a trough therebetween.

37. The extension arm of claim 1, wherein said upper channel, said lower channel, said first end cap and said second end cap are pivotably attached in such a manner that said first end cap shaft and said second end cap shaft face opposite

directions.

38. An extension arm for adjustably mounting a device to a support mount, said extension arm comprising:

a forearm extension having a first end for attachment to the device and a second end;

a first end cap pivotably attached to the support mount;

a second end cap pivotably attached to the second end of said forearm extension;

an upper channel having a first roller at a first end and a second roller at a second end, wherein said rollers are integrally cast with said upper channel, said first roller configured to be pivotably attached to said first end cap and said second roller configured to be pivotably attached to said second end cap;

a lower channel having a third roller at a first end and a fourth roller at a second end, wherein said rollers are integrally cast with said lower channel, said third roller configured to be pivotably attached to said first end cap and said fourth roller configured to be pivotably attached to said second end cap; and

a gas spring rotatably attached at a first end to said upper channel and adjustably attached at a second end to said first end cap, wherein said gas spring is configured to retain said

channels and said end caps in a parallelogram shape when the device is positioned.

39. The extension arm of claim 38, wherein a lower surface of said lower channel has a cable channel aperture formed therein.

40. The extension arm of claim 39, wherein said cable channel aperture runs along a longitudinal centerline of said lower channel.

41. The extension arm of claim 39, wherein said cable channel aperture has two opposite edges that are parallel to a longitudinal centerline of said lower channel.

42. The extension arm of claim 39, wherein said cable channel aperture has two opposite ends, and at least one of the ends is rounded.

43. The extension arm of claim 39, further comprising a cover that is removably attachable to said cable channel aperture.

44. The extension arm of claim 38, wherein each of said

rollers of said upper and said lower channels have axial centerlines that are parallel to each other.

45. The extension arm of claim 44, wherein the axial centerlines of each of said rollers of said upper and said lower channels are perpendicular to a longitudinal centerline of each of said channels.

46. The extension arm of claim 38, wherein all of said rollers have a hole therein at an axial centerline of said roller, said first end cap has a first pair of holes on an upper edge that align with said hole in said first roller and a second pair of holes on a lower edge that align with said hole in said third roller, and said second end cap has a first pair of holes on an upper edge that align with said hole in said second roller and a pair of holes on a lower edge that align with said hole in said fourth roller.

47. The extension arm of claim 46, wherein each said end cap is pivotably attached to each said channel by inserting a pin through each said hole in each said end cap and into each said respective hole in each said roller.

48. The extension arm of claim 38, wherein said first end

cap includes a first end cap body and a first end cap shaft, said first end cap shaft pivotably attached to the support mount, and said second end cap includes a second end cap body and a second end cap shaft, said second end cap shaft pivotably attached to the second end of said forearm extension.

49. The extension arm of claim 38, wherein said upper channel has a threaded hole formed therein.

50. The extension arm of claim 49, wherein the second end of said gas spring is rotatably mounted to said upper channel via a ball stud threadedly mounted in said threaded hole in said upper channel.

51. The extension arm of claim 49, wherein said threaded hole is integrally cast with said upper channel so as to be an integral part of said upper channel.

52. The extension arm of claim 38, wherein said upper channel and said lower channel comprise a zinc material.

53. The extension arm of claim 38, wherein said upper channel and said lower channel are cast molded.

54. The extension arm of claim 38, wherein said upper channel and said lower channel are made via interlocking molding.

55. The extension arm of claim 38, wherein the second end of said forearm extension is a coupling.

56. The extension arm of claim 40, wherein the first end of said forearm extension is a coupling.

57. An extension arm for adjustably mounting a device to a support mount, said extension arm comprising:

a forearm extension having means for attachment to the device disposed at a first end and a coupling disposed at a second end;

a first end cap pivotably attached to the support mount;

a second end cap pivotably attached to said coupling of said forearm extension;

an upper channel having a first roller at a first end and a second roller at a second end, wherein said first roller is configured to be pivotably attached to said first end cap and said second roller is configured to be pivotably attached to said second end cap;

a lower channel having a third roller at a first end and a fourth roller at a second end, wherein said third roller is

configured to be pivotably attached to said first end cap and said fourth roller is configured to be pivotably attached to said second end cap; and

a gas spring rotatably attached at a first end to said upper channel and adjustably attached at a second end to said first end cap, wherein said gas spring is configured to retain said upper channel, said lower channel, said first end cap and said second end cap in a parallelogram shape when the device is positioned.

58. The extension arm of claim 57, wherein said second end coupling is a female coupling.

59. The extension arm of claim 58, wherein said second end female coupling has a set screw contained in a sidewall of the coupling.

60. The extension arm of claim 58, wherein an inner surface of said second end female coupling has a plurality of grooves formed therein.

61. The extension arm of claim 57, wherein said means for connecting is a coupling.

62. The extension arm of claim 61, wherein said first end

coupling is a female coupling.

63. The extension arm of claim 62, wherein said first end female coupling has a set screw contained in a sidewall of the coupling.

64. The extension arm of claim 62, wherein an inner surface of said first end female coupling has a plurality of grooves formed therein.

65. The extension arm of claim 57, wherein said forearm extension includes a U-shaped channel disposed between said means for attachment and said second end coupling.

66. The extension arm of claim 65, wherein said U-shaped channel is disposed so that an opening of said U-shaped channel points downward.

67. The extension arm of claim 61, wherein said first end coupling has a first axial centerline and said end coupling has a second axial centerline and the first axial centerline and the second axial centerline are parallel to each other.

68. The extension arm of claim 67, wherein the first axial

centerline and the second axial centerline are perpendicular to a longitudinal centerline of said U-shaped channel.

69. The extension arm of claim 68, wherein a centerline of said first end coupling and a centerline of said second end coupling are aligned with the longitudinal centerline of said U-shaped channel.

70. The extension arm of claim 69, wherein when the first axial centerline and the second axial centerline are vertically disposed, said U-shaped channel is disposed therebetween at an angle.

71. The extension arm of claim 69, wherein when the first axial centerline and the second axial centerline are vertically disposed, said U-shaped channel is horizontally disposed therebetween.

72. The extension arm of claim 68, wherein a lower surface of said U-shaped channel is aligned with a first edge of said first end coupling and a first edge of said second end coupling.

73. The extension arm of claim 72, wherein when the first axial centerline and the second axial centerline are vertically

disposed, said U-shaped channel is disposed therebetween at an angle.

74. The extension arm of claim 72, wherein when the first axial centerline and the second axial centerline are verticall disposed, said U-shaped channel is horizontally disposed therebetween.

75. An end cap for use in an extension arm that adjustably mounts a device to a support mount, said end cap comprising:

a partially enclosed housing having a first endwall, a second endwall and at least one sidewall, said first endwall having a hole contained therein;

a shaft connected to said second endwall; and

a pair of shelves disposed within said partially enclosed housing adjacent to said second endwall, said pair of shelves forming a groove therebetween.

76. The end cap of claim 75, wherein each of said shelves has self-tapping screw holes formed therein.

77. The end cap of claim 75, further comprising stops located within said partially enclosed housing proximate to said first endwall and said second endwall.

78. The end cap of claim 75, wherein said at least one sidewall is semicircular in shape and connects to said first endwall and said second endwall.

79. The end cap of claim 75, further compromising a pair of trough walls formed within said partially enclosed housing, said pair of trough walls forming a trough therebetween.

80. The end cap of claim 75, further compromising:

a clevis having a hole therein;

a rod in threaded engagement with said clevis, wherein said clevis is configured to slide within said end cap when said rod rotates around its axial centerline.

81. The end cap of claim 80, wherein said rod includes a first end having a shaped opening, a shoulder adjacent to the first end, a threaded portion, and a second end.

82. The end cap of claim 81, wherein the first end of said rod is located within said hole in said first endwall, and said shoulder of said rod abuts an inner surface of said first endwall.

83. The end cap of claim 81, wherein said rod is configured to rotate around its axis when a shaped key is inserted in said shaped opening and is turned.

84. The end cap of claim 81, wherein the second end of said rod is rotatably secured within said groove and is retained in place by a retainer clip fastened to said shelves.

85. The end cap of claim 84, wherein said retainer clip is fastened to said pair of shelves by screws.

86. The end cap of claim 75, wherein said partially enclosed housing, said shaft, and said pair of shelves are fabricated from a zinc material.

87. The end cap of claim 75, wherein said partially enclosed housing, said shaft and said pair of shelves are cast molded.

88. The end cap of claim 75, wherein said partially enclosed housing, said shaft and said pair of shelves are made via interlocking molding.

89. An upper channel for use in an extension arm that

adjustably mounts a device to a support mount, said upper channel comprising a body having a first roller at a first end and a second roller at a second end, wherein said body and said rollers are integrally cast.

90. The upper channel of claim 89, wherein said body includes a threaded hole formed therein.

91. The upper channel of claim 90, wherein said threaded hole is integrally cast with said body and said rollers.

92. The upper channel of claim 90, further comprising a ball stud threadedly mounted to said threaded hole.

93. The upper channel of claim 92, further comprising a gas spring rotatably attached to said ball stud.

94. The upper channel of claim 89, wherein said body and said rollers are fabricated from a zinc material.

95. The upper channel of claim 89, wherein said body and said rollers are cast molded.

96. The upper channel of claim 89, wherein said body and

said rollers are made via interlocking molding.

97. The upper channel of claim 89, wherein each of said rollers have holes located at a respective axial centerline.

98. A lower channel for use in an extension arm that adjustably mounts a device to a support mount, said lower channel comprising a body having a first roller at a first end and a second roller at a second end, wherein said body and said rollers are integrally cast.

99. The lower channel of claim 98, wherein a lower surface of said body has a cable channel aperture formed therein.

100. The lower channel of claim 99, wherein said cable channel aperture runs along a longitudinal centerline of said body.

101. The lower channel of claim 99, wherein said cable channel aperture has two opposite edges that are parallel to a longitudinal centerline of said body.

102. The lower channel of claim 99, wherein said cable channel aperture has two opposite ends, and at least one of the

ends is rounded.

103. The lower channel of claim 99, further comprising a cover that is removably attachable to said cable channel aperture.

104. The lower channel of claim 98, wherein said body and said rollers are fabricated from zinc material.

105. The lower channel of claim 98, wherein said body and said rollers are cast molded.

106. The lower channel of claim 98, wherein said body and said rollers are made via interlocking molding.

107. The lower channel of claim 98, wherein each of said rollers have holes located at a respective axial centerline.

108. A forearm extension for use in an extension arm that adjustably mounts a device to a support mount, said forearm extension compromising a body having a first coupling disposed at a first end and a second coupling disposed at a second end.

109. The forearm extension of claim 108, wherein said second

coupling has a set screw contained in a sidewall.

110. The forearm extension of claim 108, wherein an inner surface of said second coupling has a plurality of grooves formed therein.

111. The forearm extension of claim 108, wherein said first coupling has a set screw contained in a sidewall.

112. The forearm extension of claim 108, wherein an inner surface of said first coupling has a plurality of grooves formed therein.

113. The forearm extension of claim 108, wherein said body is U-shaped.

114. The forearm extension of claim 108, wherein a centerline of said first coupling and a centerline of said second coupling are aligned with a longitudinal centerline of said body.

115. The forearm extension of claim 108, wherein a lower surface of said body is aligned with a lower edge of said first coupling and a lower edge of said second coupling.

116. The forearm extension of claim 108, wherein said body is disposed at an angle between said first coupling and said second coupling when said first coupling and said second coupling are disposed such that an axial centerline of each is vertical.

117. The forearm extension of claim 108, wherein said body is horizontally disposed between said first coupling and said second coupling when said first coupling and said second coupling are disposed such that an axial centerline of each is vertical.

118. A method of forming an extension arm that adjustably mounts a device to a support mount, the method comprising:

forming an upper channel that includes a roller at each end and a threaded hole therein;

forming a lower channel that includes a roller at each end;

forming two identical endcaps having

a partially enclosed housing having a first endwall, a second endwall and at least one sidewall, wherein the first endwall contains a hole therein, and the second endwall has a shaft connected thereto, and

a pair of shelves disposed within the partially enclosed housing near the second endwall, the pair of shelves forming a groove therebetween;

forming a rod including a fist end having a shaped opening,

a shoulder adjacent to the first end, a threaded portion, and a second end;

threading the rod through a hole in a clevis;

placing the first end of the rod within the hole in the first endwall of a first one of the end caps until the shoulder abuts an inner surface of the first endwall;

placing the second end of the rod within the groove in the first end cap;

securing the second end of the rod by placing a retainer over the rod and connecting the retainer to the shelves;

forming a forearm extension having a body, a first end for connecting to a second one of the end caps and a second end for connecting to the device;

threadedly mounting a ball stud in the threaded hole of the upper channel;

connecting one end of a gas spring to the ball stud and a second end of the gas spring to a fastening member of the clevis;

attaching the upper channel, the lower channel, the first end cap and the second end cap to form a parallelogram; and

connecting the first end of the forearm extension and the shaft of the second end cap.

119. The method of claim 118, wherein the upper channel, the lower channel, the first end cap and the second end cap are

attached in a manner such that the shaft of the first end cap and the shaft of the second end cap face opposite directions.

120. The method of claim 118, further comprising

painting the forearm extension prior to said connecting the first end of the forearm extension;

painting an outer surface of the end caps prior to said placing the first end of the rod, said placing the second end of the rod, said securing the second end of the rod, said attaching the upper channel, and said connecting the first end of the forearm extension;

painting an outer surface of the upper channel prior to said connecting one end of a gas spring, and said attaching the upper channel; and

painting an outer surface of the lower channel prior to said attaching the upper channel.

121. The method of claim 120, further comprising

drilling holes in a center of each upper channel roller subsequent to said painting an outer surface of the upper channel; and

drilling holes in a center of each lower channel roller subsequent to said painting an outer surface of the lower channel.

122. The method of claim 118, wherein said forming an upper channel includes integrally casting the upper channel including the rollers and the threaded hole contained therein.

123. The method of claim 122, wherein said integrally casting the upper channel includes integrally casting the upper channel from zinc.

124. The method of claim 118, wherein said forming a lower channel includes integrally casting the lower channel including the rollers.

125. The method of claim 124, wherein said integrally casting the lower channel includes integrally casting the lower channel from zinc.

126. The method of claim 118, wherein said forming a lower channel includes forming a lower channel with a roller at each end and a cable channel aperture in a lower surface.

127. The method of claim 126, further comprising placing a cover within the cable channel aperture.

128. The method of claim 118, wherein said forming two

identical endcaps includes integrally casting the two identical endcaps including the partially enclosed housing, the shaft, and the pair of shelves disposed within the partially enclosed housing.

129. The method of claim 128, wherein said integrally casting the two identical endcaps includes integrally casting the two identical endcaps from zinc.

130. The method of claim 118, wherein said forming a forearm extension includes forming the forearm extension having a coupling at the first end.

131. The method of claim 118, wherein said forming a forearm extension includes forming the forearm extension having a U-shaped body.

132. A method of forming an extension arm that adjustably mounts a device to a support mount, the method comprising:

integrally casting an upper channel that includes a roller at each end and a threaded hole contained therein;

integrally casting a lower channel that includes a roller at each end;

forming a first end cap including a clevis;

forming a second end cap;

forming a forearm extension having a body, a first end for connecting to the second end cap and a second end for connecting to the device;

threadedly mounting a ball stud in the threaded hole of the upper channel;

connecting one end of a gas spring to the ball stud and a second end of the gas spring to a fastening member of the clevis;

attaching the upper channel, the lower channel, the first end cap and the second end cap to form a parallelogram; and

connecting the first end of the forearm extension and the second end cap.

133. The method of claim 132, wherein said forming the first end cap includes

forming a partially enclosed housing having a first endwall, a second endwall and at least one sidewall, wherein the first endwall contains a hole therein, and the second endwall has a shaft connected thereto;

forming a pair of shelves disposed within the partially enclosed housing near the second endwall, the pair of shelves forming a groove therebetween;

forming a rod including a fist end having a shaped opening, a shoulder adjacent to the first end, a threaded portion, and a

second end;

threading the rod through a hole in the clevis;

placing the first end of the rod within the hole in the first endwall until the shoulder abuts an inner surface of the first endwall;

placing the second end of the rod within the groove; and

securing the second end of the rod by placing a retainer over the rod and connecting the retainer to the shelves.

134. The method of claim 132, wherein said forming the second end cap includes

forming a partially enclosed housing having a first endwall, a second endwall and at least one sidewall, wherein the first endwall contains a hole therein, and the second endwall has a shaft connected thereto; and

forming a pair of shelves disposed within the partially enclosed housing near the second endwall, the pair of shelves forming a groove therebetween.

135. The method of claim 132, wherein said integrally casting the upper channel includes integrally casting the upper channel from zinc.

136. The method of claim 132, wherein said integrally

casting the lower channel includes integrally casting the lower channel from zinc.

137. The method of claim 132, wherein said forming a lower channel includes forming the lower channel with the roller at each end and a cable channel aperture in a lower surface.

138. The method of claim 132, further comprising placing a cover within the cable channel aperture.

139. A method of forming an extension arm that adjustably mounts a device to a support mount, the method comprising:

forming an upper channel that includes a roller at each end and a threaded hole contained therein;

forming a lower channel that includes a roller at each end;

forming a first end cap including a clevis;

forming a second end cap including a shaft;

forming a forearm extension having a body, a coupling for connecting to the second end cap and means for connecting to the device;

threadedly mounting a ball stud in the threaded hole of the upper channel;

connecting one end of a gas spring to the ball stud and a second end of the gas spring to a fastening member of the clevis;

attaching the upper channel, the lower channel, the first end cap and the second end cap to form a parallelogram; and

connecting the coupling of the forearm extension to the shaft of the second end cap.

140. The method of claim 139, wherein said forming a forearm extension includes forming the forearm extension having a U-shaped body.

141. The method of claim 139, wherein said forming a forearm extension includes forming the forearm extension having a coupling for connecting to the device.

142. The method of claim 141, further comprising locating a set screw within a sidewall of the device coupling.

143. The method of claim 141, wherein said forming a forearm extension includes forming the forearm extension having a plurality of grooves within an inner surface of the device coupling.

144. The method of claim 139, further comprising locating a set screw within a sidewall of the shaft coupling.

145. The method of claim 139, wherein said forming a forearm extension includes forming the forearm extension having a plurality of grooves within an inner surface of the shaft coupling.

146. The method of claim 139, wherein said forming an upper channel includes integrally casting the upper channel including the rollers and the threaded hole contained therein.

147. The method of claim 146, wherein said integrally casting the upper channel includes integrally casting the upper channel from zinc.

148. The method of claim 138, wherein said forming a lower channel includes integrally casting the lower channel including the rollers.

149. The method of claim 139, wherein said integrally casting the lower channel includes integrally casting the lower channel from zinc.

150. The method of claim 139, wherein said forming a lower channel includes forming the lower channel with the rollers and a cable channel aperture in a lower surface.

151. A method of forming end caps for use in an extension arm that adjustably mounts a device to a support mount, the method comprising forming two partially enclosed housings, each housing having a first endwall with a hole formed therein, a second endwall with a shaft connected thereto, at least one sidewall, and a pair of shelves disposed within the partially enclosed housing adjacent to the second endwall, the pair of shelves forming a groove therebetween.

152. The method of claim 151, further comprising

forming a rod including ~~a fist~~ end having a shaped opening, a shoulder adjacent to the first end, a threaded portion, and a second end;

threading the rod through a hole in a clevis;

placing the first end of the rod within the hole in the first endwall of a first one of the partially enclosed housings until the shoulder abuts an inner surface of the first endwall;

placing the second end of the rod within the groove in the first one of the partially enclosed housings; and

securing the second end of the rod by placing a retainer over the rod and attaching the retainer to the shelves.

153. The method of claim 151, wherein said forming two

partially enclosed housings includes integrally casting the two partially enclosed housings including the endwalls, the shaft, the at least one sidewall, and the pair of shelves.

154. The method of claim 153, wherein said integrally casting the two partially enclosed housings includes integrally casting the two partially enclosed housings from zinc.

155. The method of claim 151, wherein said forming two partially enclosed housings includes forming the two partially enclosed housings each having stops located within the partially enclosed housings adjacent to the first endwall and the second endwall.

156. The method of claim 151, wherein said forming two partially enclosed housings includes forming the two partially enclosed housings each having a pair of trough walls within the partially enclosed housings, the pair of trough walls forming a trough therebetween.

157. A method of forming channels for use in an extension arm that adjustably mounts a device to a support mount, the method comprising:

integrally casting an upper channel that includes a roller

at each end and a threaded hole formed therein; and

integrally casting a lower channel that includes a roller at each end.

158. The method of claim 157, further comprising painting an outer surface of the upper channel and the lower channel.

159. The method of claim 158, further comprising drilling holes in a center of each roller subsequent to said painting.

160. The method of claim 157, wherein said integrally casting the upper channel includes integrally casting the upper channel from zinc.

161. The method of claim 157, wherein said integrally casting the lower channel includes integrally casting the lower channel from zinc.

162. The method of claim 157, wherein said integrally casting a lower channel includes integrally casting the lower channel with the rollers and a cable channel aperture in a lower surface.

163. The method of claim 162, further comprising placing a

cover within the cable channel aperture.

164. The method of claim 157, further comprising threadedly mounting a ball stud in the threaded hole of the upper channel.

165. A method of forming a forearm extension for use in an extension arm that adjustably mounts a device to a support mount, the method comprising forming a body having a first end with a coupling and a second end having means for connecting to the device.

166. The method of claim 165, wherein said forming a forearm extension includes forming the forearm extension having a U-shaped body.

167. The method of claim 165, wherein said forming a forearm extension includes forming the forearm extension having a coupling for connecting to the device.

168. The method of claim 167, further comprising locating a set screw within a sidewall of the device coupling.

169. The method of claim 167, wherein said forming a forearm extension includes forming the forearm extension having a plurality of grooves within an inner surface of the device

coupling.

170. The method of claim 165, further comprising locating a set screw within a sidewall of the first end coupling.

171. The method of claim 165, wherein said forming a forearm extension includes forming the forearm extension having a plurality of grooves within an inner surface of the first end coupling.

Abstract of the Disclosure

An extension arm suitable for mounting a flat-screen electronic peripheral device, such as a computer monitor or television, comprises a forearm extension that has at one end a first coupling for attachment to a tilter, a platform or other means for supporting a flat-screen device and at the other end a second coupling. The extension arm also comprises a pair of end caps, each having a shaft. The shaft of the first end cap is pivotably rotatable in a support mount, such as a wall, desk or pole mount. The shaft of the second end cap is pivotably rotatable in the second coupling of the forearm extension. The extension arm also comprises an upper channel and a lower channel. Each channel has at opposite ends a pair of integrally cast rollers which are pivotably attached to each of the end caps. The upper and lower channels and the end caps form an adjustable parallelogram. The shape of the parallelogram is retained by a gas spring, which is attached at a first end to a ball stud mounted in the upper channel and adjustably mounted at a second end to the first end cap. A clevis is located within the first end cap and is pivotably attached to the second end of the gas spring. A threaded rod threadedly engages the clevis, such that the clevis slides within the first end cap when the rod rotates around its axial centerline.

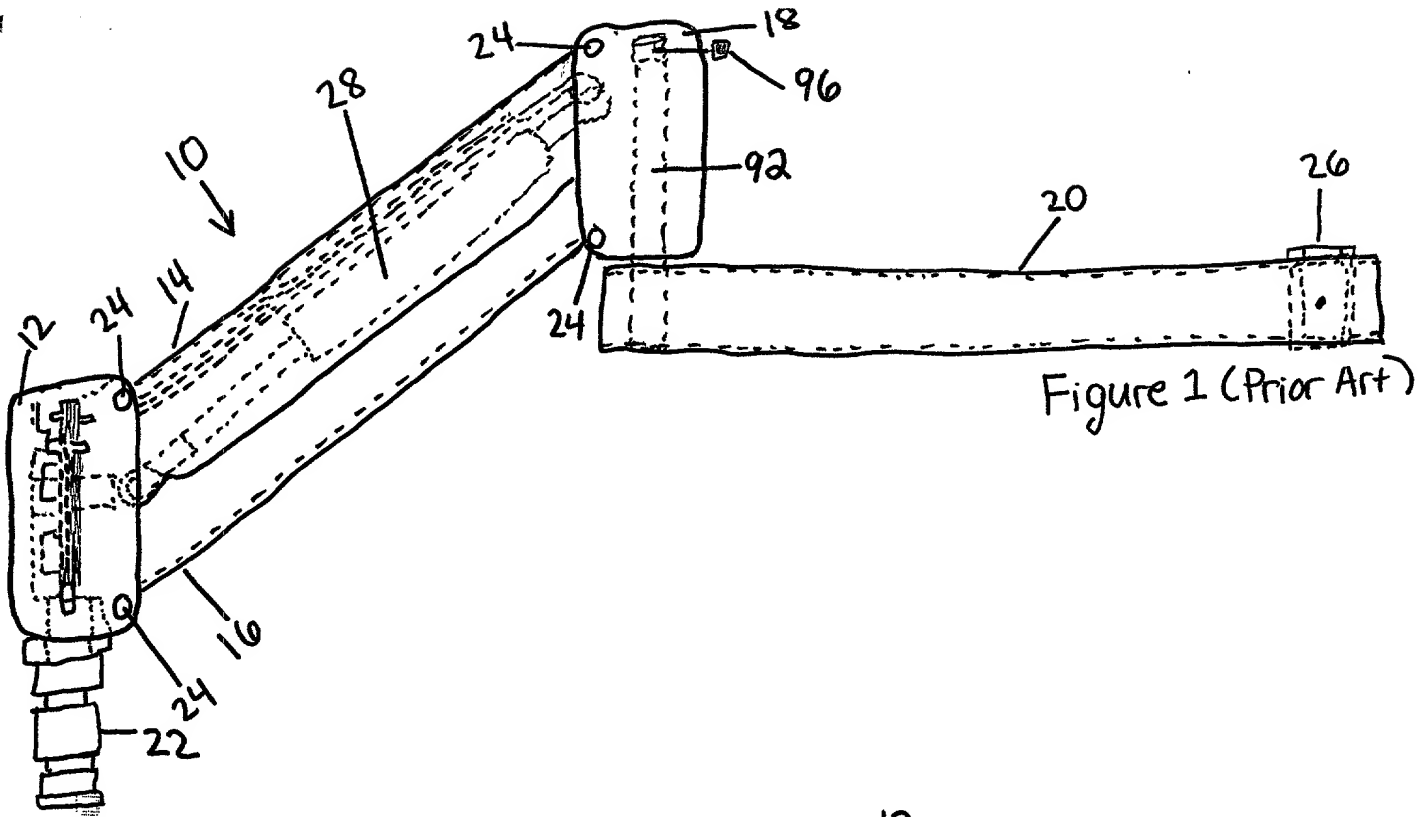

Figure 1 (Prior Art)

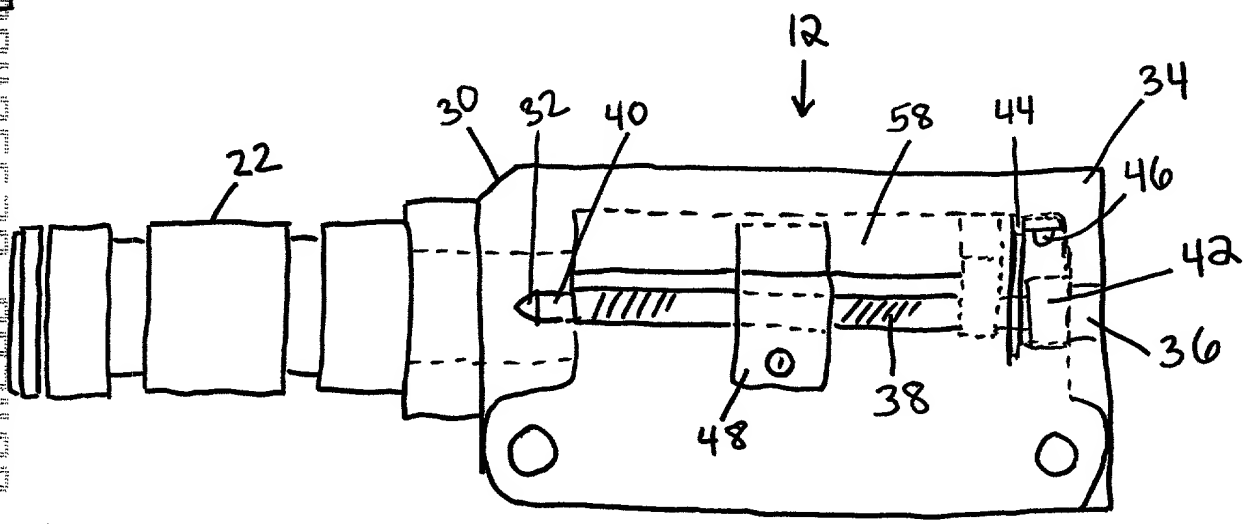

Figure 2 (Prior Art)

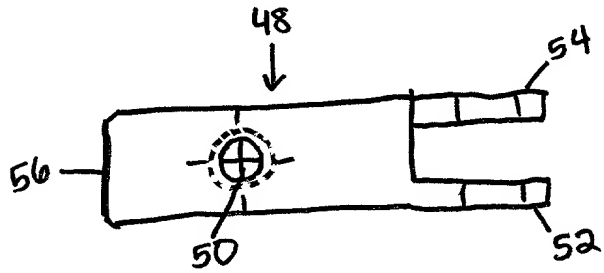

Figure 3 (Prior Art)

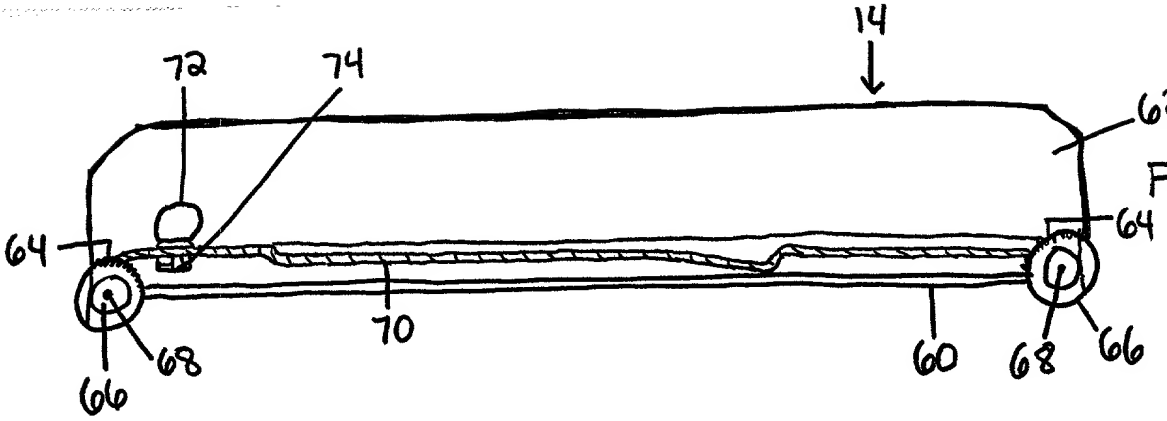

Figure 4a (Prior Art)

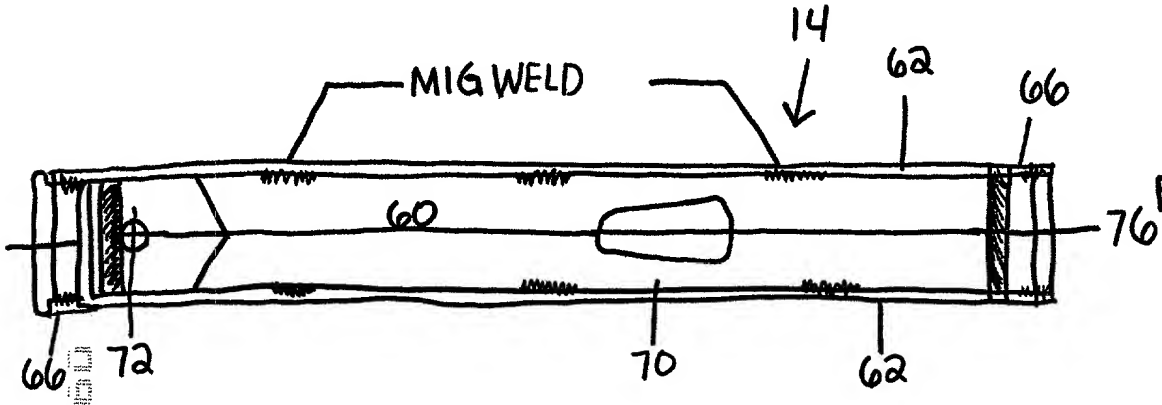

Figure 4b (Prior Art)

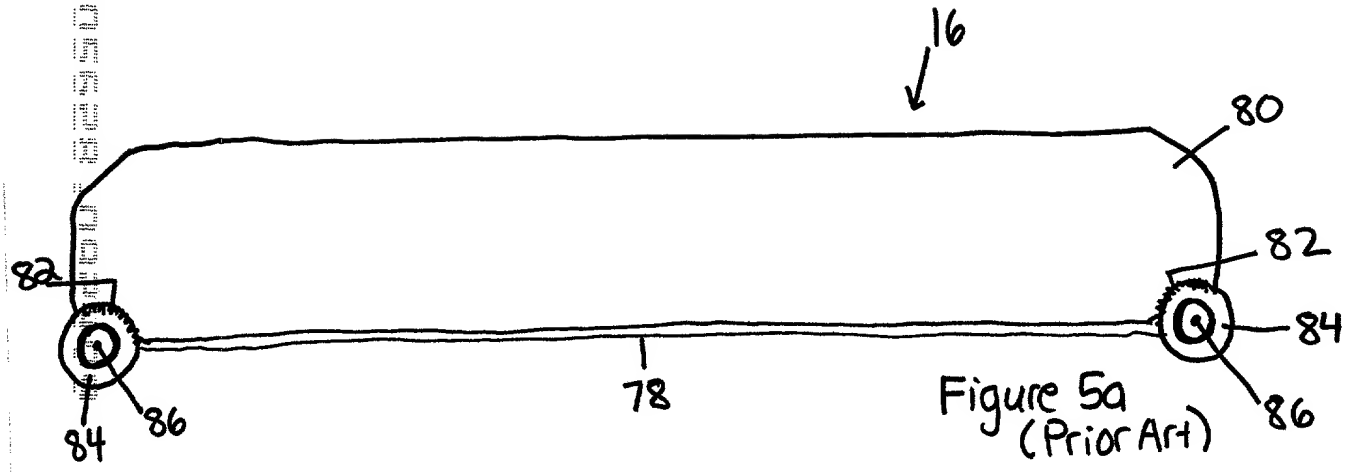

Figure 5a (Prior Art)

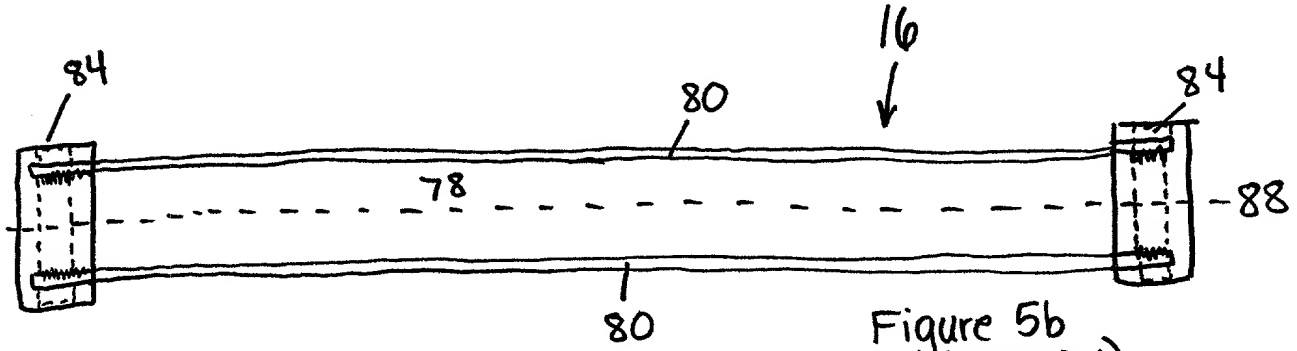

Figure 5b (Prior Art)

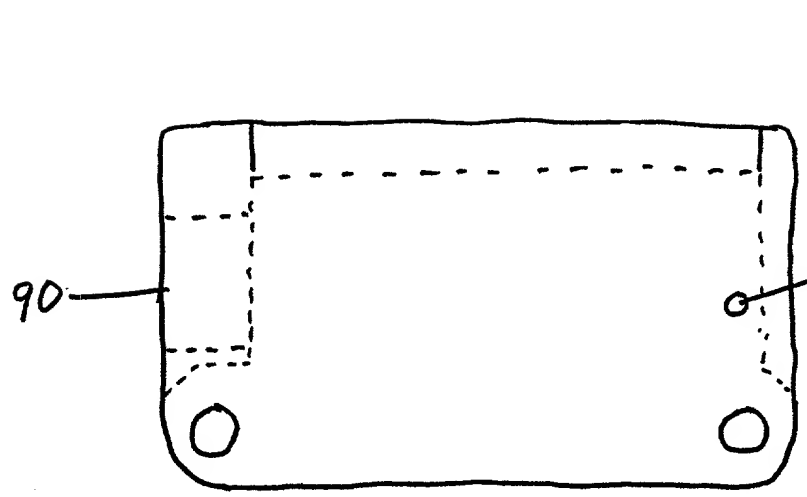

Figure 6 (Prior Art)

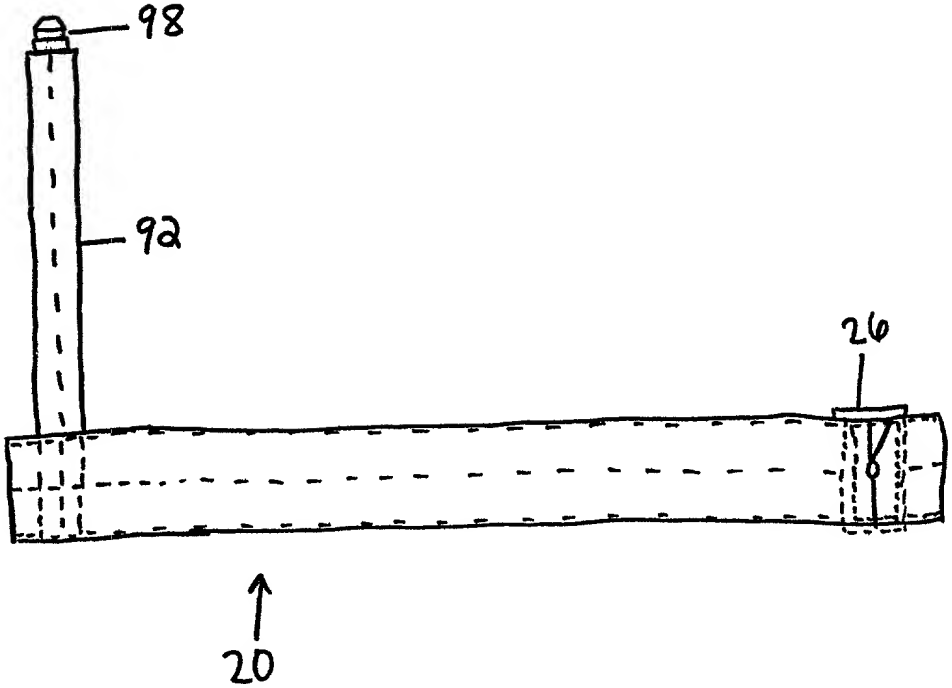

Figure 7 (Prior Art)

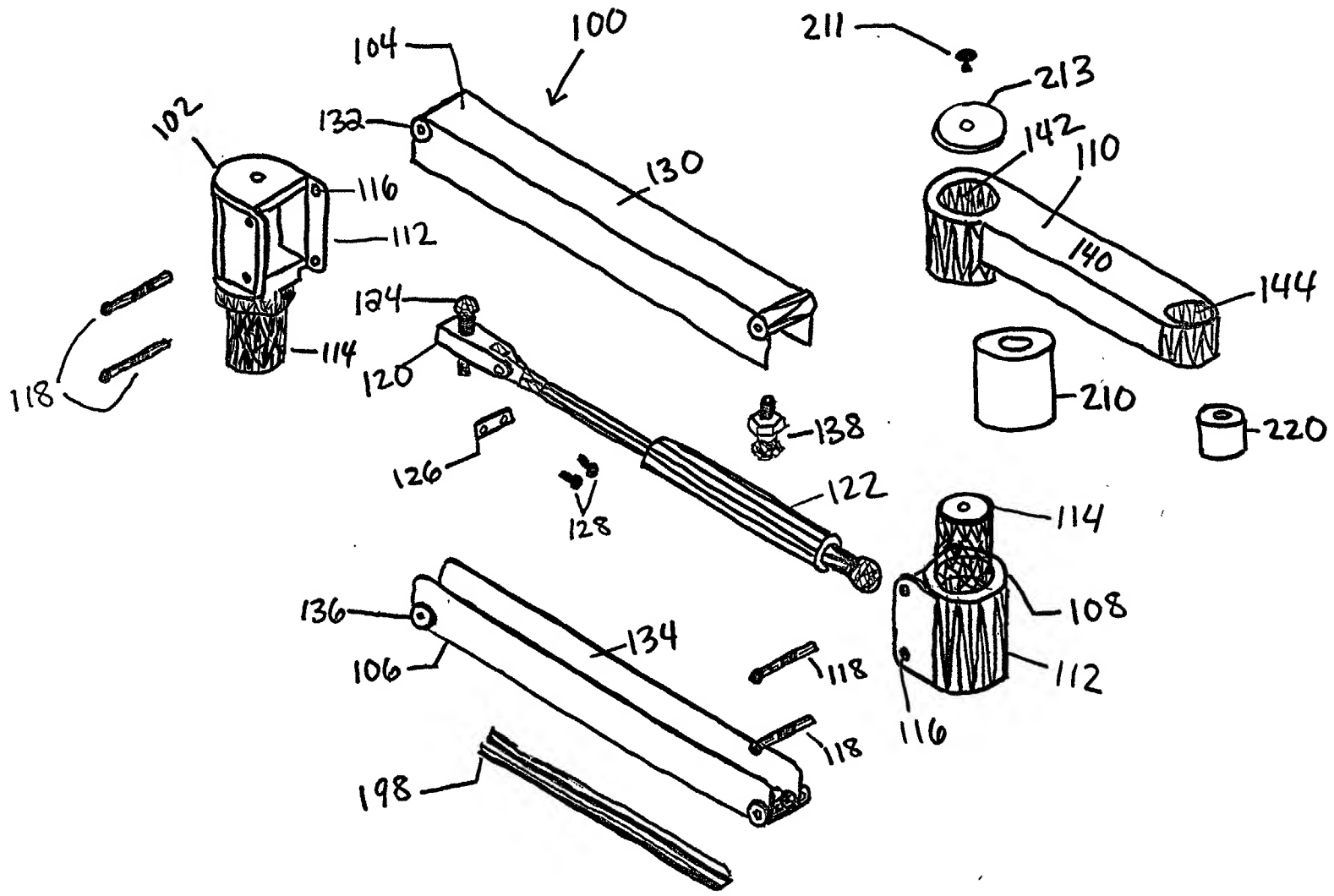
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Figure 8

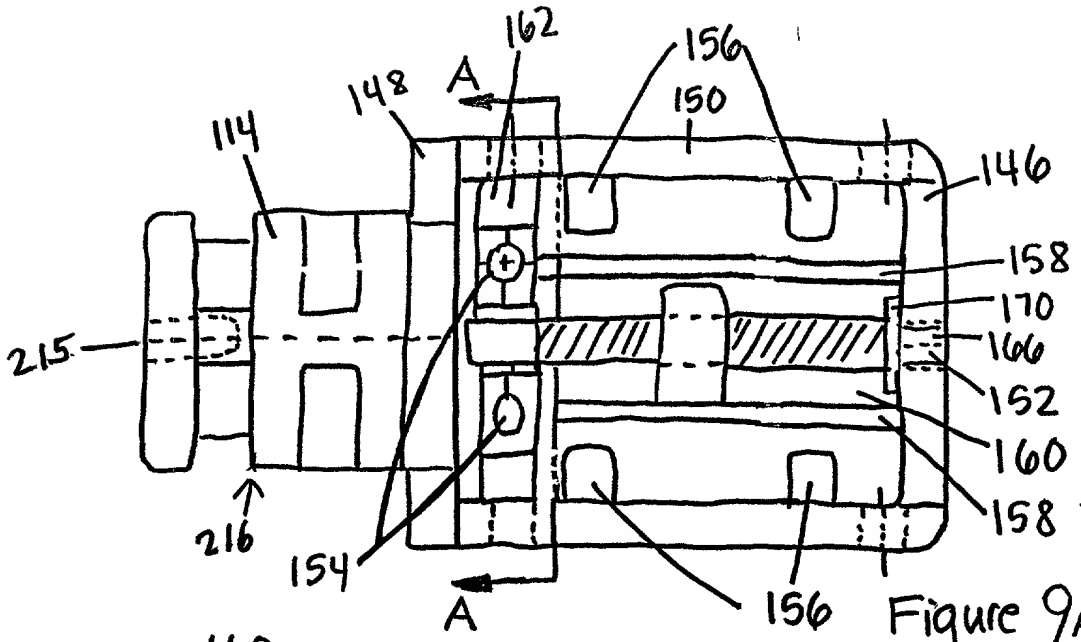

Figure 9A

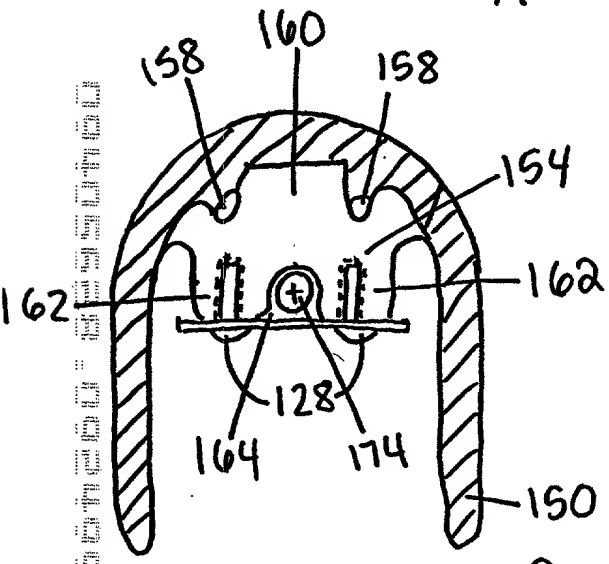

Figure 9B

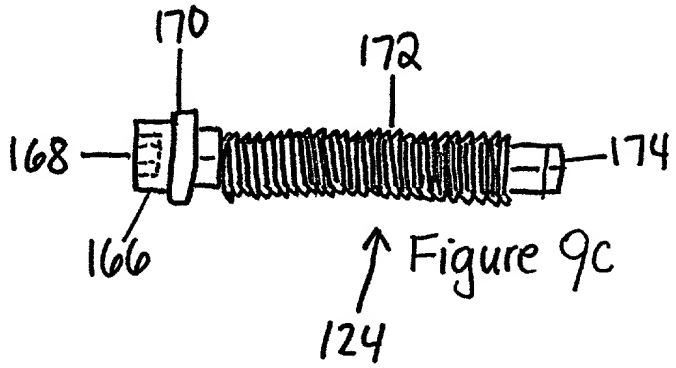

Figure 9C

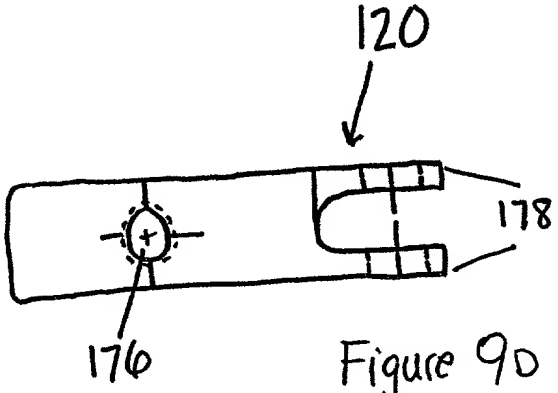

Figure 9D

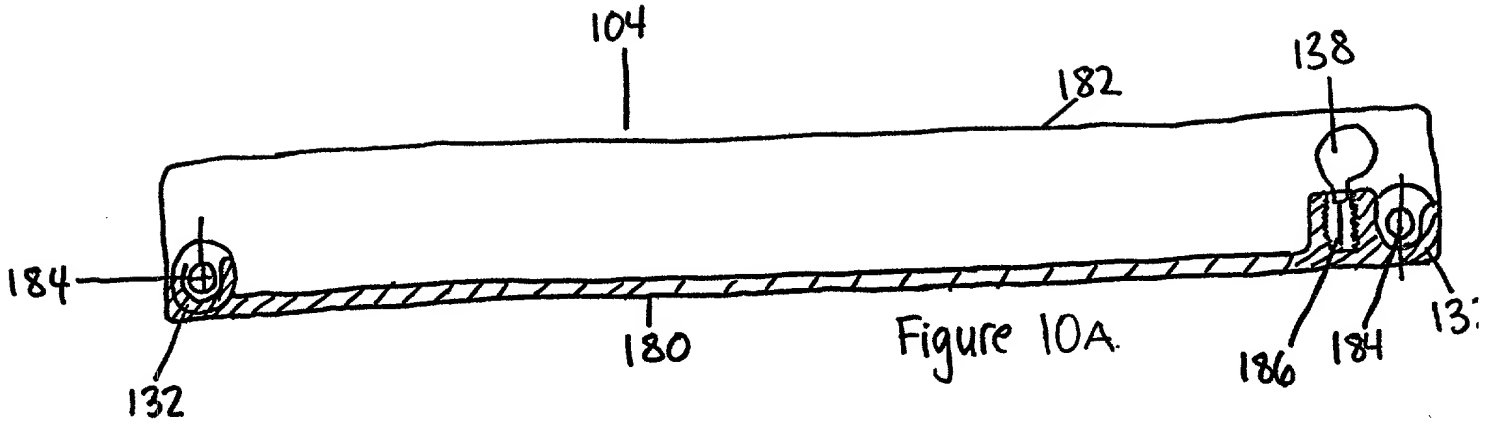

Figure 10A.

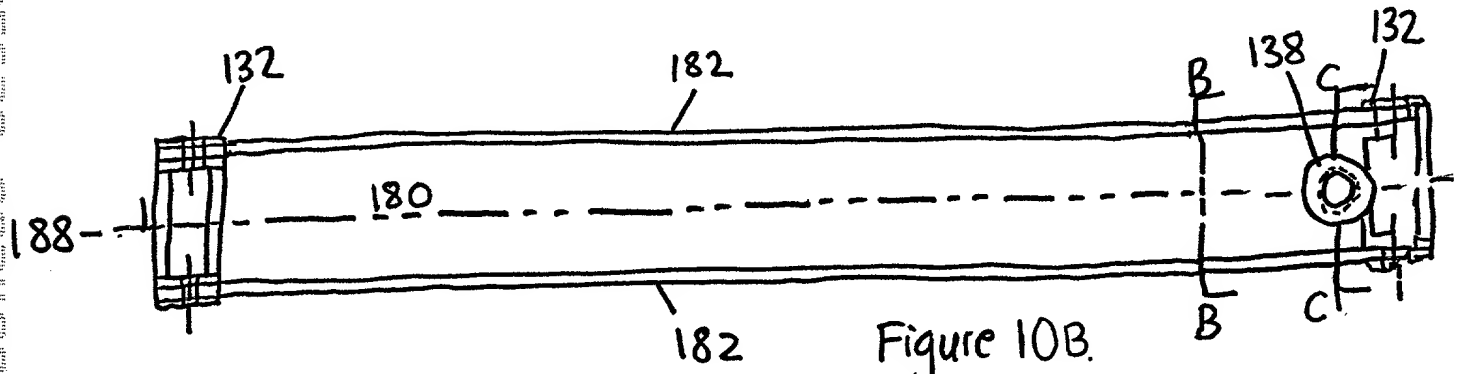

Figure 10B.

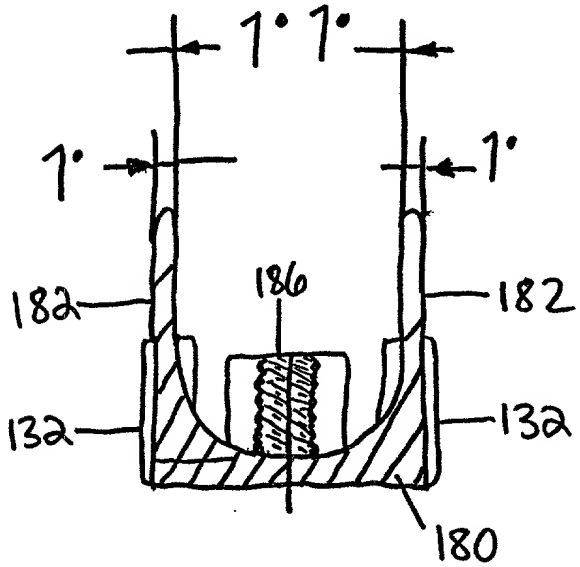

Figure 10C.
B-B

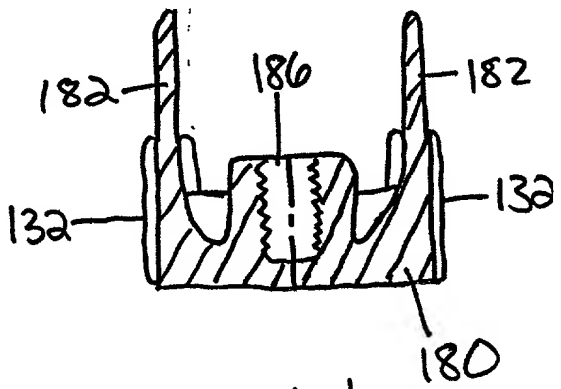

Figure 10d
C-C

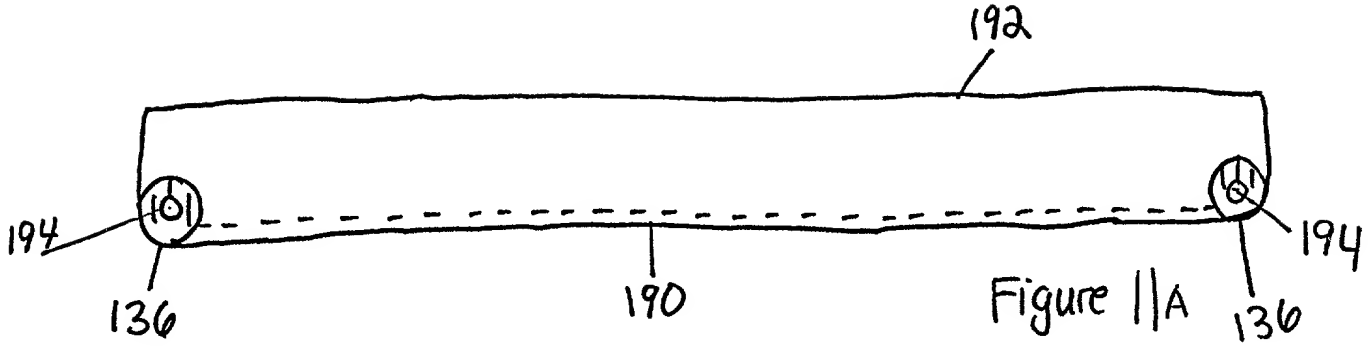

Figure 11A

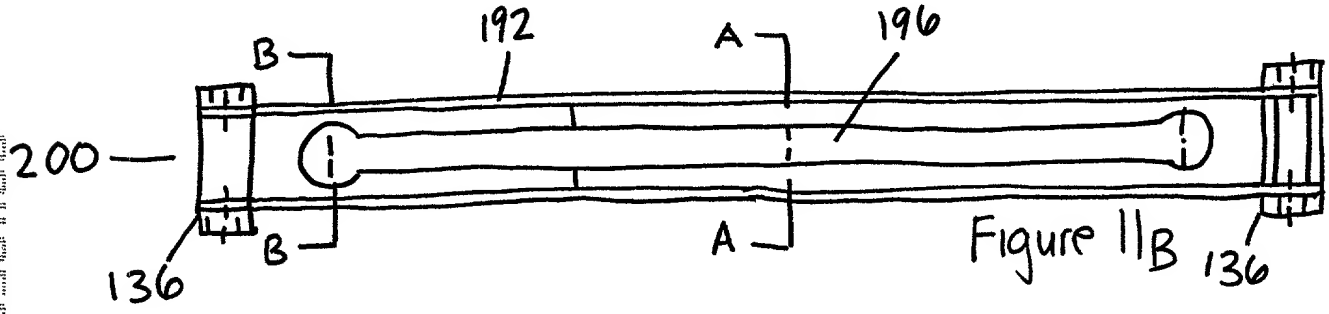

Figure 11B

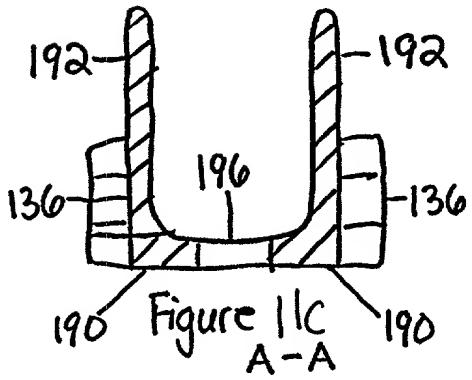

Figure 11C
A-A

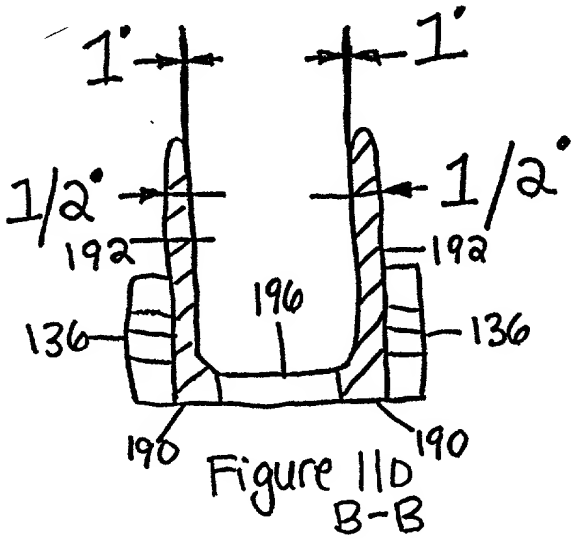

Figure 11D
B-B

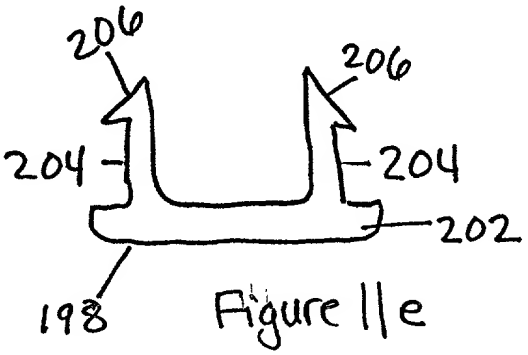

Figure 11e

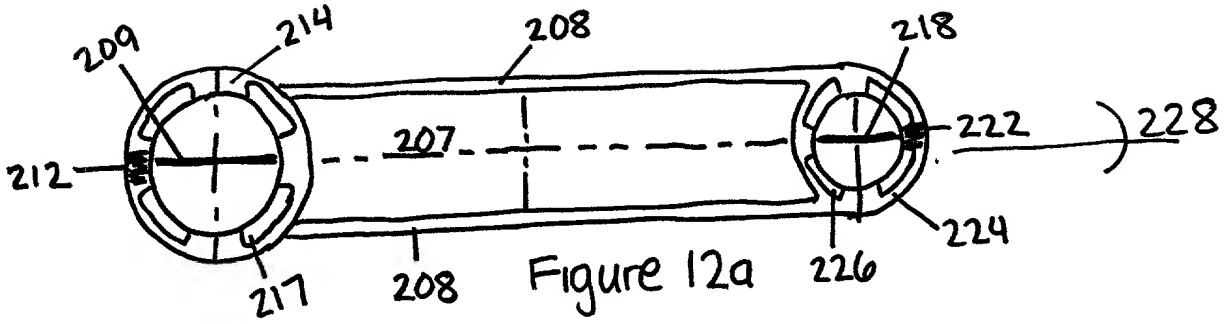

Figure 12a

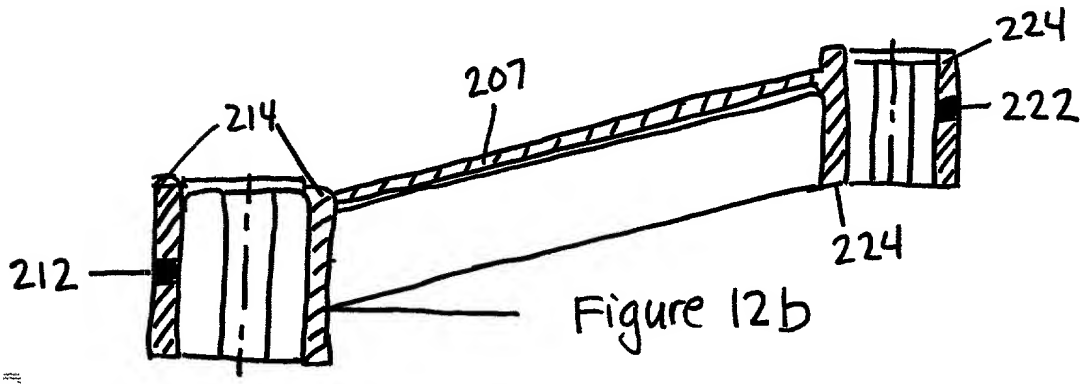

Figure 12b

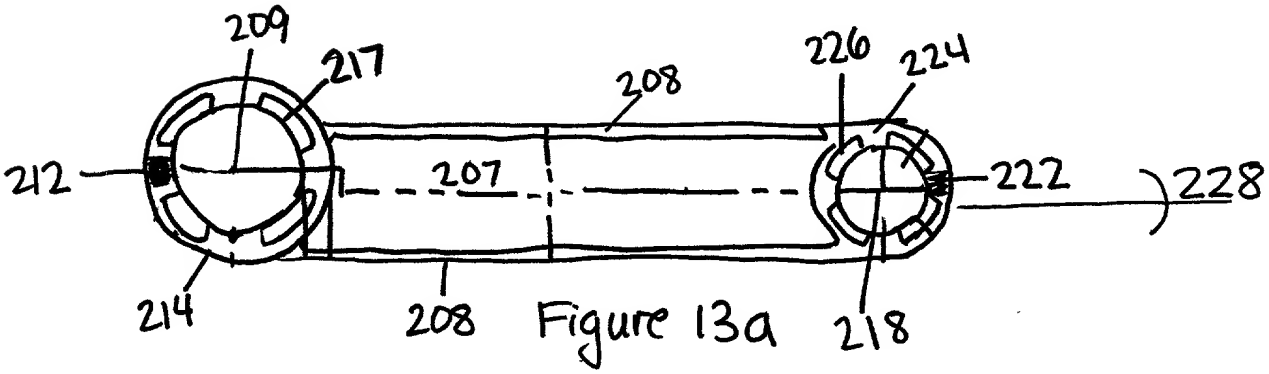

Figure 13a

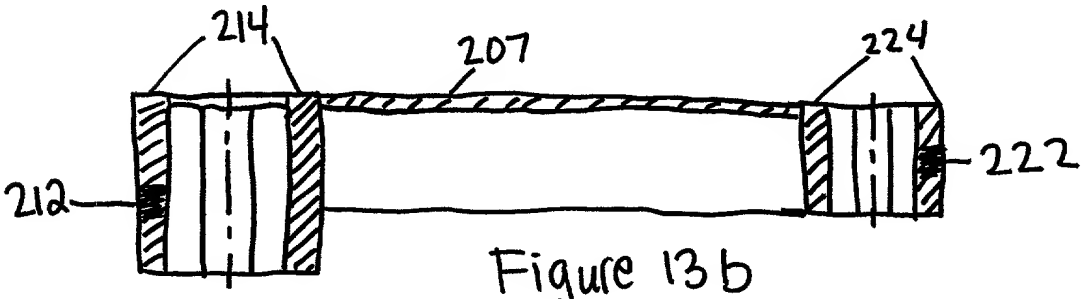

Figure 13b

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLN NUMBER	FILING DATE	FIRST NAMED INVENTOR		ATTY. DKT. NO.
UNKNOWN	UNKNOWN	ODDSEN		3757.3003
TITLE ARM APPARATUS FOR MOUNTING ELECTRONIC DEVICES			ART UNIT UNKNOWN	EXAMINER UNKNOWN

DECLARATION AND POWER OF ATTORNEY

☒ Declaration Submitted with Initial Filing, or ☐ Declaration Submitted after Initial Filing

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

ARM APPARATUS FOR MOUNTING ELECTRONIC DEVICES

the specification of which

☒ is attached hereto, or
☐ was filed on (DD/MM/YYYY) as United States Application Number or PCT International Application Number and was amended on (DD/MM/YYYY) (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code §119 (a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (DD/MM/YYYY)	Priority Not Claimed	Copy Attached? YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority sheet attached hereto.

I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (DD/MM/YYYY)
60/133,378	10/05/1999

☐ Additional provisional application numbers are listed on a supplemental priority sheet attached hereto.

I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s), or §365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Application Number	Parent Filing Date (DD/MM/YYYY)	Parent Patent Number *(if applicable)*

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority sheet attached hereto.

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Name	Registration Number
John P. Blasko	31,149
Douglas J. Ryder	43,073

☐ Additional attorney(s) and/or agent(s) are listed on a supplemental sheet attached hereto.

Send correspondence to: John P. Blasko
J.P. Blasko Prof. Corp.
111 North Broad Street
Doylestown, PA 18901

Direct telephone calls to: John P. Blasko (215) 348-7775

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Sole or First Inventor: ODDSEN, ODD N., JR.

Signature: _____ Date: Sept 24 1999

Residence: Easton, Pennsylvania

Post Office Address: 2100 Liberty Street, Easton, PA 18042

Citizenship: United States of America

Full Name of Additional Joint Inventor:

Signature: _____ Date: _____

Residence:

Post Office Address:

Citizenship:

☐ Additional inventors are being named on supplemental sheet(s) attached hereto.